A Summary of Current Program, 9/1/62 and Preliminary Report of Progress for 11/1/60 to 9/1/62

FARM ECONOMICS DIVISION

of the

ECONOMIC RESEARCH SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

This progress report of U.S.D.A. and cooperative research is primarily a tool for use of scientists and administrators in program coordination, development and evaluation; and for use of advisory committees in program review and development of recommendations for future research programs.

There is included under each problem area in the report a brief and very general statement on the nature of the research being conducted by the State Agricultural Experiment Stations and the professional manpower being devoted by the State stations to such research. Also included is a brief description of related work conducted by private organizations. No details on progress of State station or industry research are included except as such work is cooperative with U.S.D.A.

The summaries of progress on U.S.D.A. and cooperative research include some tentative results that have not been tested sufficiently to justify general release. Such findings, when adequately confirmed will be released promptly through established channels. Because of this, the report is not intended for publication and should not be referred to in literature citations. Copies are distributed only to members of Department staff, advisory committee members and others having a special interest in the development of public agricultural research programs.

This report also includes a list of publications reporting results of U.S.D.A. and cooperative research issued between November 1, 1960, and September 1, 1962. Current research findings are also published in the ERS publications The Farm Index, a monthly, and Agricultural Economics Research, a quarterly. This progress report was compiled in the Farm Economics Division, Economic Research Service, U. S. Department of Agriculture, Washington 25, D. C.

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INTRODUCTION

Farm economics research, as used in this report, deals with many and varied economic problems of agricultural production. The work is concerned with the economics of organization and management of farms, extent and utilization of land and water resources, use of capital and labor in agriculture, production and conservation practices, adjustments in production and resource use, development of depressed rural areas, farm financial problems of credit, insurance, and taxation, and appraisal of alternative production policies and programs.

Rapid technological change in agriculture and the tendency for farm production to outstrip growing demands for products gives rise to continued need for economic adjustments in our farm economy. Farms are decreasing in number and increasing in size and degree of specialization. Farm machinery, fertilizers, and other innovations, are substituting for land and labor. These trends, along with continued concern over the use and conservation of the Nation's land and water resources, and with growing concern over the problems of rural people, especially those in chronically depressed areas, challenge the most rigorous research in the field of farm economics. Results of farm economics research are used widely as aids in management decisions at the farm, area, regional, State, river basin, and national levels.

Farm economics research is conducted by the Farm Economics Division, Economic Research Service, U. S. Department of Agriculture; by all of the State experiment stations; and to a lesser extent by such other organizations as private research foundations, commercial research companies, universities, trade associations, banks, and other businesses. USDA's Farm Economics Division currently devotes about 216 professional man-years to this field of work, State experiment stations approximately 190 professional man-years, and all other organizations probably devote not more than an estimated 260 professional man-years to this type of research.

The Department's program of research and related statistical reporting in farm economics is conducted from headquarters in Washington, D. C., and is concerned chiefly with problems of regional and national scope. Field studies generally are conducted in cooperation with State experiment stations. When studies are made jointly by Federal and State workers, Federal people usually are most interested in regional and national applications of results, while State workers are most often interested in local applications. Close working relationships between Federal and State agencies have long been traditional in this field. This close cooperation in planning and conducting the work reflects joint and cooperative efforts rather than overlapping or duplication of effort.

The farm economics research program is covered under 16 area headings shown in the Table of Contents. More detailed subject-matter subheadings are given in the discussion of each area of work.

In the 22 months since progress was last reported to research advisory committees, the special policy and program contributions that the Division has been able to make have been significant. Division personnel have

responded to many requests for assistance from the Office of the Secretary, program administrators, the National Agricultural Advisory Commission, and others. In addition, many of the Division's continuing statistical series and analyses have become increasingly important in efforts to understand changes and achieve improvements in the structure and in the well being of American agriculture. Some examples of special policy and program contributions follow.

Farm production prospects and programs. Believing that a comprehensive review and analysis of the trends and prospects in farm production, the reasons therefor, and implications for farm programs would be a timely and useful service to all concerned with the continuing problem of agricultural surpluses, the Division released such an analysis early in 1961 in "Farm Production--Trends, Prospects, and Programs" (AIB 239). The study indicated that the prospect for the 1960's is for continued excessive farm production unless measures are taken to cut production. A growing population and high levels of exports are not likely to offset continued increases in yields of crops and livestock. Despite shifts in acreage, acreage-allotment and marketing-quota programs had not achieved the hoped-for balance between production and demand. Suggestions were made for improved programs for each of several commodities in the light of program experience and prospective supply-management programs.

Family farm policy. A major contribution to farm policy decisions has been made through (1) the clarification of, and the injection of realism into the concept of family farms, and (2) the distinctions made between proficient and inadequate family farms and between family and larger than family farms. Clarification of these concepts has permitted measurement of the relative efficiency of family farms, their contribution to total farm output, and the proportion of production inputs under their control. It has revealed that the chief reason for the marked reduction in numbers of farms is the drive for more proficient family farms, rather than the crowding out of efficient family farms by larger than family farms. It has disclosed the conflicts which technological advances in agriculture create (1) between our ideal of an agriculture of proficient family farms and our desire for unlimited employment opportunities in agriculture for all farm people, and (2) between our historic commitment to a fair return to agriculture on the one hand, and a freedom from restraints on entrepreneurs on the other hand.

This area of research has been made available primarily through a series of mimeographed papers presented to various groups. The great demand for presentations and interpretations of this work emanating from farm groups, civic groups, educators, researchers, and administrators, including the Office of the Secretary, is indicative of its impact on farm policy decisions. Examples of the series of papers released in this area and the group to which they were presented, include: "Beliefs and Values as a Factor in the Farm Problem," November 1961, Agricultural Editors Association; "Changing Organization of American Agriculture," October 1961, National Planning Association, Agricultural Committee; "The Relevance of the Jeffersonian Dream Today," June 1962, Homestead Centennial Symposium.

Land and water policy. Division personnel have been called on repeatedly by the Office of the Secretary and others for assistance on land and water policies and programs. The Chief of the Land and Water Economics Branch served as Co-chairman, with an Assistant to the Secretary, of the Department's

Land and Water Policy Committee. Division personnel made major contributions to "Land and Water Resources--A Policy Guide" prepared by the Committee and endorsed by the Secretary. A number of the policy recommendations were included in the new Food and Agriculture Act of 1962. Among other things, this report concluded that our food and fiber requirements in 1980 could be met by 50 million fewer acres of average quality cropland than we had in 1959, an acreage that would be available for meeting growing needs for grassland pasture, urban expansion, and other special-purpose needs. As to water, agriculture is expected to continue as the predominant consumptive user of water well beyond 1980. Acres irrigated by that time would be expected to increase by about a fourth over 1960, and irrigation withdrawals and consumption by about a fifth. The conservation and economic management of water for agricultural uses, competing increasingly as it will for urban and industrial uses, is critical for the balanced growth of the economy.

Agricultural land has been converted to other uses at the rate of about 2 million acres per year during the 1950's. About a million acres yearly went into urban and other built-up purposes, including highways, roads, and airports. The other million acres were added to rural parks, wildlife refuges, national defense areas, water supply facilities, and flood control areas. Total cropland declined 20 million acres between 1950 and 1960, from 478 million acres to 458 million.

Division personnel also contributed substantially to the national, and six regional, "Land and People" conferences conducted by the Secretary. Division publications used at the conferences for distribution or display included "A Graphic Summary of Land Utilization;" "Major Uses of Land and Water in the United States, with Special Reference to Agriculture" (AER 13); "Family and Larger-Than-Family Farms--Their Relative Position in American Agriculture" (AER 4); "Opportunities for Economic Development in Low-Production Farm Areas--A Study of Incomes, Employment, and Resources" (AIB 234); "The Why and How of Rural Zoning" (AIB 196); "Farm Production Trends, Prospects, and Programs" (AIB 239); "The Effects on Farm Operating Units of Land Acquisition for Controlled-Access Highways" (ERS-69); and "Zoning for Rural Areas" (Leaflet 510).

Rural development. The Department's renewed emphasis on, and substantial expansion of, its Rural Areas Development Program called for a stepped-up program of research and service. To meet these needs, the Division established a Rural Development Branch, which also was given the responsibility of coordinating all rural development research within ERS. Division personnel were given leadership for preparation of a task force report "Guides to Development in Depressed Rural Areas," and for economic appraisals of the program. Division personnel also analyzed income and other criteria for designating, and for reviewing the designation of, rural county eligibility for Area Redevelopment Act assistance.

In its program of research to support the RAD program, the Division has emphasized research to enhance understanding of factors contributing to economic growth and greater employment and income opportunities in depressed rural areas. In its pioneering research on recreation and tourism in the Missouri Ozarks, it showed the encouraging possibilities of that source of income and employment for rural people in certain kinds of depressed rural areas. Studies of part-time farming in Michigan indicate that the proportion of total farmers who work off the farm probably will

continue to increase in areas where nonfarm opportunities exist; most part-time farmers in these areas consider part-time farming a permanent way of making a living; and higher and steadier income is usually the primary aim of farmers who take off-farm jobs. Resource use in part-time farming generally is not so efficient as in full-time farm operations, but a regrouping of resources cannot occur unless enough nonfarm jobs are available to absorb a portion of the labor released. Adjustments to part-time off-farm opportunity usually can be made without sacrificing family income, but adjustments to full-time farming usually cannot be made without some sacrifice of family income in the short run.

Outdoor recreation. At the request of the Outdoor Recreation Resources Review Commission, Division personnel pioneered in studies in two other important fields of outdoor recreation resources and opportunities. One report, "Private Outdoor Recreation Facilities," is the first known comprehensive analysis made of the private outdoor recreation business in the U. S., and is the only one of the Commission's 27 study reports that deals with the private sector of the recreation field. Based on questionnaires returned by private recreation businesses, special reports from organized recreation interests, and detailed case studies, the report analyzed 14 types of private outdoor recreation enterprises and made recommendations for encouraging and improving this rapidly growing part of the economy. The recommendations were largely adopted by the Commission and included in its report to the President and the Congress.

The other report, "Potential New Sites for Outdoor Recreation in the Northeast," dispelled a widely held view that few suitable sites were left in this densely populated region of the U. S. In the "inner zone" in the 10 Northeastern States (all land within 25 miles of the limits of the urban areas of Boston, New York City, and Philadelphia-Camden), prospects for potential recreation sites are very favorable. At least one type of potential recreation site occurred in each 129 acres of forest, each 258 acres of idle land, and each 320 acres of pasture. Most of these potential sites are on land not well suited to agriculture or urban or industrial development. In the "outer zone" (all land between inner zone and State boundaries) potential recreational sites on private land occurred at a frequency of 1 per 132 acres of forest, 1 per 303 acres of idle land, and 1 per 645 acres of pasture.

The urban rural fringe. Farm people, other residents in rural areas, and State and local public officials throughout the country are struggling with the heavy impacts of advancing urban and industrial development in their respective communities, a trend that is in prospect for many years ahead as we continue to become an increasingly industrialized Nation. The Division's research program in this area, cooperative with the States, was intensified. Study of a Michigan township in the path of urbanization indicated that farmers, although in position to induce local action, seemed to have little awareness of the pace of urbanization, of the problems that urbanization would bring, or of what might be done to guide or ameliorate the impacts. Another study analyzed the types of improved local government available for rural people in growing metropolitan areas, and the stake of rural people in securing better local governments in the sprawling metropolitan areas surrounding our rapidly growing cities. Studies of preferential assessment of farmland based on its value for continued farming rather than on its value for potential residential and commercial development were made. Other

ways of obtaining and maintaining open spaces in rural areas were studied. New developments in rural zoning and related public land-use controls were analyzed and published. In Delaware, a land-use classification system was developed specifically for the rural-urban fringe to serve as a basis for more sensible land use, and the system was tested by practical use in that State as an aid to regional planning.

Appraisal of the 1961 feed grain program. A study of about 600 participants in the 1961 feed grain program, and of 600 nonparticipants, in selected corn and grain sorghum areas was made at the request of the Agricultural Stabilization and Conservation Service. The study provided a variety of first hand information useful to that Service in administering and improving the program. It revealed little evidence of any difference in the productivity of cropland on farms in the program compared with those not in the program, or between the productivity of land retired under the program and that kept in production on individual farms. Further, the increase from 1960 to 1961 in the amount of fertilizer used per acre of corn generally was about the same for participants and nonparticipants. However, because of their reduced acreages of corn or grain sorghum, participants used less total fertilizer for these crops in 1961 than in 1960, whereas nonparticipants maintained or expanded their acreages of these crops and greatly increased the total fertilizer applied.

A more comprehensive analysis of the 1962 feed grain program is being made currently, again at the request of ASCS, to provide additional insights on factors influencing the success of the 1962 program, and the probable effects of alternative program features such as grazing of diverted acres.

Western grazing fee study. At the request of the Bureau of Land Management and the Forest Service, the Division evaluated the effects of alternative levels of grazing fees and adjustments in grazing privileges on the organization and net returns of various types and sizes of cattle and sheep ranches that use public grazing lands in the Western States. Such analyses are essential to these public land managing agencies for the policy reviews necessitated by a Presidential directive to appraise the adequacy of returns to the Government for the use of public resources.

An increase in grazing fees would increase cash operating costs and reduce net incomes because no significant offsetting changes could be made in the way ranches are operated. Of 66 representative cattle ranches budgeted, nearly half fail to break even at current rates of grazing fees. They continue to operate by reducing or ignoring charges for depreciation and returns to family labor. In contrast with their inability to adjust to increased grazing fees, most of the ranches could make some adjustments in operations that would help offset a reduction in grazing privileges on the public range. However, as much as a 20-percent reduction in permitted use would reduce net income on most of the cattle and sheep ranches.

AREA NO. 1. AGRICULTURAL ADJUSTMENTS, PRODUCTION RESPONSE AND FARM PROGRAM APPRAISAL

Problem. A chronic major problem in agriculture is to adjust production, both in the aggregate and for major commodities, to market outlets. Achievement of economic balance in agriculture and adequate returns to farmers is likely to be especially difficult over the next five to ten years because the capacity of agriculture to produce probably will more than keep pace with the food and fiber requirements of the anticipated larger population. Some resources now used in over-expanded lines of production need to be shifted or be more efficiently used. Individual farmers can reduce costs per unit of product by reorganizing farm enterprises, adopting improved technology, and increasing the size of their farms. But when many farmers do this, total output mounts and the problem of bringing total supply in line with total demand is intensified. Thus adjustment opportunities cannot be considered solely from the viewpoint of the irdividual farmer. National and regional aggregate production response are important in considering the farm adjustment problem. Analyses of profitable adjustments on representative farms and estimates of both the aggregate output that would be forthcoming if all farms were efficiently organized and operated, and the aggregate response that farmers may be expected to make, are needed as a basis for evaluating the adjustments that would be profitable both to individual farmers and to the industry under different economic situations and for appraising the effects of alternative farm adjustment programs. Continuing analysis of trends in farm output and resource productivity is also needed to measure changes in the farm situation.

USDA PROGRAM

The program encompasses four major types of work. Studies of national and regional productivity conducted in Washington, D. C. analyze the factors responsible for changes in total output and resource productivity for the Nation and for 10 broad farm production regions. These studies become the basis for long-term projections of prospective trends in farm output and productivity, in numbers of farms, and in other major characteristics of the Nation's agriculture. Studies of production response and needs for adjustment are conducted in Washington, D. C. and at six field locations. These studies emphasize the methodological developments required to appraise the production response farmers are likely to make individually and in the aggregate to changes in technology, prices, programs, and other factors. Attention is also given to the optimum (least cost) regional distribution of crop and livestock production. Area adjustment studies in feed-livestock, dairy, wheat, cotton, and rice areas emphasize the determination of the most profitable adjustments for numerous representative farms to alternative combinations of prices. The most profitable organizations weighted by the proportion of the population represented by each typical farm provide first approximations of the area implication of individual farm adjustments. These studies are conducted in cooperation with 15 State agricultural experiment stations in dairy areas, 12 in cotton areas, 11 in wheat areas, and 22 in feed-livestock areas. Studies of adjustment opportunities in rice areas are conducted in Arkansas, Louisiana, Mississippi, and Texas. Studies of agricultural policies and program appraisals are oriented toward an understanding of the impacts and means of improving programs and policies at the national

level, including the acreage allotment programs, wheat programs, the probable effect of alternative sugar quota and pricing policies, prospective use of land released from the Conservation Reserve, and impacts of the current feed grain program. This work involved formal cooperation with 12 State experiment stations.

A total of 64.2 Federal professional man-years are devoted to this area of work: 1.2 man-years to national and regional productivity; 14.4 man-years to appraisal of production response and needs for adjustment; 8.2 man-years to appraisal of adjustments in dairy areas; 10.3 man-years to adjustments in cotton areas; 6.3 man-years to adjustments in wheat areas; 2.0 man-years to adjustments in rice areas; 12.2 man-years to adjustments in feed-livestock areas; 4.0 man-years to appraisals of agricultural policies and programs; and 5.6 man-years to program leadership.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

National and regional productivity studies are underway in the North Central and Southern Regions. Primary emphasis is placed on the effect of technological change on the productivity of agricultural resources. Studies of production response and needs for adjustment include two regional projects--S-42, "An Economic Appraisal of Adjustment Opportunities in the Southern Region to Meet Changing Conditions," and W-54, "Appraisal of Opportunities for Adjusting Farming to Prospective Markets."

In addition to regional work, 13 projects are underway in 3 regions. Research in the Southern Region is directed toward the impact of technology on input-output relationships. Work in the North Central Region represents aggregative analysis of forces and relationships determining adjustments of resource use in a changing economy. Research in the Western Region is concerned with relative profitability of alternative farming adjustments in situations with limited water supplies. Two projects in the Northeast Region, eight in the North Central Region, and one in the Western Region are primarily concerned with dairy adjustment needs and opportunities at both the farm and State levels. One project in the Western Region is directed to the determination of the most profitable organization of cotton farms under specified assumptions regarding long-range changes in physical and economic conditions; and to the estimation of aggregate cotton output under optimum farm organizations. One project in the North Central Region and one in the Western Region are concerned with wheat farm adjustments in a changing economy. A project in the Southern Region deals with adjustment opportunities in rice producing areas of the Mississippi Delta. In the North Central Region, regional project NC-54, "Supply Response and Adjustments for Hog and Beef Cattle Production" is underway.

The Southern Region is coordinating its research on agricultural policies and programs under regional project SM-14. W-59 performs a similar function in the Western Region. Studies on adjustment programs designed to improve farm prices and incomes are coordinated through interregional project IRM-1.

It is estimated that 37.3 professional man-years are devoted to this area of research by the State experiment stations.

Examples of industry and other organizations supporting research in this area are the Great Plains Wheat Development Association, which has provided

active and continuous consultation in the analysis of the impact of alternative wheat programs on wheat farms; the Cotton Council, which has provided consultation as well as some financial support to analyses of alternative adjustments on cotton farms; and the Upper Midwest Research and Development Council which, in cooperation with the University of Minnesota, has initiated an economic study of factors contributing to economic growth in the Upper Midwest, and, in addition, is providing financial support for analyses of adjustments on hog-beef farms and of the impacts of farm programs on farms in Minnesota. Estimated annual expenditures are equivalent to some 4 or 5 professional man-years.

Several private universities and research institutes maintain research staffs which use a portion of their resources in assembling and analyzing information on historical changes and projections of volume of farm output, resource requirements, and alternative solutions to the farm problem. Estimated annual expenditures are equivalent to 10 or 12 professional man-years.

A number of the larger city banks, particularly the Federal Reserve Banks, and private agricultural supply and marketing companies retain a small staff of employees or consultants to analyze and project changes in the structure of agriculture and to appraise the impact of current and prospective changes in farming on their businesses. Estimated annual expenditures probably are equivalent to about 25 man-years.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. National and Regional Productivity in Agriculture

1. Farm output in 1962 is one percent less than the 1961 record but equals 1960. Production of livestock and livestock products is at the record output of 1961. Animal units of breeding livestock increased enough to offset a slight decline in the livestock production per breeding unit. Total crop production in 1962 is 2 percent below the 1961 production. Crop production per acre of cropland is at a record high--2 percent greater than 1961 and 13 percent above the 1957-59 average. The acreage of cropland used for crops is the smallest of record--3 percent less than 1961 and 8 percent less than the 1957-59 average.

2. The volume of inputs used in agriculture in 1961 was the same as in 1960. However, these inputs were the most productive of record--1 percent greater than the previous high. The composition of inputs continued to move toward less labor but more purchased inputs. Purchased inputs in 1961 accounted for nearly two-thirds of all inputs used in agriculture compared with 46 percent in 1940.

The United States and regional indexes of total production, crop production per acre, animal units of breeding livestock, and livestock production per animal breeding unit have been shifted from a 1947-49 weight and reference period to a 1957-59 weight and reference period as required by the Bureau of the Budget. The 1957-59 weights were tested before incorporating them into the index series. All of the latest revised production data were also incorporated. The input series has not incorporated the new weights but has been shifted to the new reference period.

3. Preliminary results were obtained from a pilot study designed to measure the effects of weather on corn yields in Iowa. The specific purpose was to develop an index of weather to be used for adjusting actual corn yields. The technique developed for this purpose is applicable to the construction of weather indexes for all aggregate measures of crop production now published for farm production regions and the United States as a whole. Thus, it can aid in analyses of farmers' production response and in related research. Variation in corn yields is the result of two broad factors, weather and technology. Since 1929, technological changes affecting corn yields seem to have come in two steps. Yields between 1929 and 1935 were relatively stable, slightly under 40 bushels per acre. Beginning around 1935, yield-increasing factors, chiefly hybrid seed, came into play raising the yield level slightly above 50 bushels per acre. Yields remained at this level throughout the 1940's and early 1950's. Beginning around 1954 a second period of rapid increase in yield began. This increase seems to have been due primarily to technology rather than to better weather.

4. As part of the work going forward under the ERS Committee on Economic Projections, subcommittees of ERS, SRS, and other agency specialists were set up for major crops to analyze yield trends for major crops and prepare projections for several years ahead. Projections for 1967 of per-acre yields were developed for the major crops individually, and for minor crops as a group. For corn, sorghum grain and wheat, separate projections were made for two alternative assumptions as to the degree of production control under Federal farm programs. Under the "A" (high acreage) assumptions, the projected yields for 1967 are: corn, 68.0 bushels per acre; sorghum grains, 47.4 bushels; and wheat, 26.6 bushels. Projected yields were slightly higher under the "B" assumptions, where tighter production controls would reduce acreages grown. Crop production per acre for all crops was projected at 8 percent above the 1961 level under the "A" assumptions, and 9 percent under the "B" assumptions.

Under the "B" assumption, total crop production and total farm output is projected to increase at a slightly slower rate than the expected rate of population growth from 1957-59 to 1967. Under the "A" assumption, both crop production and farm output would somewhat exceed the rate of increase in population.

A study of the long-term production outlook for Western agriculture has been completed and a manuscript is being cleared for publication under the title "Long-Term Production Prospects for Western Agriculture." Among the main findings of this study is a projected regional increase in crop production by 1975 of 40 percent over 1959. Most of this increase is expected to come from higher yields per acre, due to wider use of irrigation and improvements in other crop production practices. The productive capacity of pasture and rangeland in the Western States is expected to be about 80 percent over what it was in 1950.

Some study has been devoted to the development of techniques to explain and project the adoption of new technology by farmers. This information is essential in projecting long-term output potential. Two exploratory approaches have been tested. In the first, changes in size of farm have been used as an indicator of technological change. In the second approach, statistical growth curves have been fitted to the cumulative adoption of specific technologies by farmers in several Corn Belt States.

B. Appraisal of Production Response and Needs for Adjustment

Findings from producer panel studies, though limited because of the need for several years of observation, indicate that the pre-production price expectations of farm operators are not heavily influenced by any particular price data series and that while actual acreages planted are fairly consistent with operator plans, non-price influences may be more important than moderate price changes in causing farmers to adjust, or not to adjust, production. These findings will appear in a forthcoming report "The Role of Operators' Expectations in Farm Adjustment."

Short- and long-run changes in the aggregate regional acreage of cotton and major alternative crops are explained with reasonable accuracy by changes in relative crop profitability, resource supplies and technology, and by inflexibilities in adjustment due to factors such as risk and uncertainty. Year-to-year changes in output are less amenable to accurate prediction from data on crop profitability and the structure of farming in the region because of weather and post-planting changes in farm practices. The nature of these relationships is described in a paper, accepted for publication, "An Approach to Production Response." A book, "Recursive Programming and Production Response" (in press) includes a more detailed presentation of empirical results. A close relationship exists between crop, livestock, and total United States farm output and associated physical inputs. Weather has a significant effect on crop output for the United States as a whole.

Analysis of the optimum (least cost) distribution of field crop production for 1954 showed most of the production of feed grains and soybeans specified for the Corn Belt and Corn Belt fringe areas. Wheat production was indicated primarily for the Great Plains and the Pacific Northwest. Cotton had a high comparative advantage in the irrigated areas of the West and in areas of northern Alabama and the Mississippi Delta. Compared with 209 million acres of these crops actually planted in 1953--a year without acreage controls--normal needs of 1954 could have been met with 31 million fewer acres. The regional production pattern for 1965 projections is essentially the same as for 1954 except that wheat production is extended into parts of the Southeast. Production requirements for 1965, from the standpoint of economically efficient farm production, are about 34 percent above the requirements estimated for 1954, although the requirements for soybeans are 61 percent above those for 1954. Results show that estimated production requirements could be met in 1965 with 7 million acres fewer than were planted to the same crops in 1953. Two manuscripts in process which summarize the findings are "Regional Adjustments in Grain Production to Meet Increased Demands with Current and Improved Farm Practices," and "Regional Analysis of Production Adjustments in the Major Field Crops--Historical and Prospective." Analysis of optimum regional adjustments including livestock and livestock products has not progressed to a similar stage of findings.

C. Appraisal of Adjustments in Dairy Areas

The optimum combinations of enterprises for several combinations of assumed prices have been determined for all representative farm situations in the Lake States study areas of Illinois, Iowa, Michigan, Minnesota, and Wisconsin. These farm organizations have been weighted according to the proportion of the total population they represent to provide estimates of supply relations

under the assumption that all firms are organized in a manner to maximize profits. Demands for Lake States study area milk were projected to 1965 with the assumption that the study area will supply milk to the same proportion of the Nation's population that it did in 1959. These demand and supply projections were combined to give estimates of equilibrium prices. The results are summarized below.

Demand for Lake States milk in 1965 is projected to be up 5.1 percent from 1959 for milk used in manufactured milk products, and down 4.4 percent for milk going into Class I (fluid) utilization. Using a constant (1959) price for milk products, demand for all milk in 1965 is projected at 214.765 million cwt. or up 11.196 million cwt. from that of 1959.

Using the normative aggregate supply schedules as an estimate of supply, an equilibrium supply of milk in 1965 would be produced at prices about $0.50 per cwt. below actual prices of 1959. Also a much greater proportion of this milk would be supplied by fluid eligible producers than was the case in 1959. This would have the effect of increasing the rate of diversion of fluid eligible milk into manufacturing uses as compared to 1959. Thus the equilibrium price differential between fluid eligible and manufacturing milk would be about $0.22 or 50 percent less than in 1950.

A larger portion of the resources of Grade B producers in the region would be moved into production of other livestock, hogs and beef cattle. This adjustment would require substantially increased purchases of feed grains since a much higher proportion of the ration of hogs and fat cattle would be concentrate feeds.

Aggregates for several of the major inputs and products important to Lake States agriculture were tabulated concurrently with the aggregate programmed supply of milk and hogs. These aggregate data are evaluated briefly in order to better depict the type of aggregate adjustments that were programmed to be optimal for the study area.

Net corn purchases would be large; they were programmed to total about 250 million bushels at the equilibrium milk price with market hogs at $14.50. Total purchases would be about doubled (502 million bushels) if hog prices were projected at $16 per cwt. Substantial corn purchases, particularly in Wisconsin, with lower hog prices ($11.50 and $13.00) reflect the profitability of feeding cattle when hog prices are relatively unfavorable.

The incidence of purchase and fattening of feeder cattle was programmed to be substantially in excess of 1959 levels (by as much as 500 percent) with low hog and milk prices. Although somewhat competitive with dairy at the lowest milk prices programmed, beef feeding competes primarily with hog production in the study area. Since beef prices were programmed at only one level ($17 per cwt. all beef cattle), the programmed aggregates are determined by variations in hog and milk prices only. At hog prices of $16.50 per cwt. or higher, the levels of beef feeding programmed to be optimal (about 2.4 million head) are closer to the volume of beef feeding occurring in the study area in 1959.

Optimal programmed feeder pig purchases totaled about 2 million head with equilibrium milk prices and hog prices of $14.50 and about 3.4 million head

with market hog prices of $16 per cwt. With market hog prices higher than $16 per cwt., it would be profitable to increase feeder pig purchases up to over 10 million head. Since most of the supply of feeder pigs must come from outside of the study area, it is impossible to evaluate these aggregates. However, the purchase of 2 million head of feeder pigs represents an increase of at least 50 percent from total purchases reported by study area farmers in 1959.

Programmed production of all crops is slightly higher than in 1959, reflecting some improvements in technology. However, difference in aggregate production of cash crops including soybeans, sugar beets, and wheat are small in comparison with total U. S. production. Greater production of corn and forage crops (by roughly 20 percent) is largely the result of improved yields due to use of more fertilizer than in 1959. These increased yields are mostly utilized in servicing larger livestock enterprises.

Almost all (over 90 percent) of the individual strata are programmed to use more capital than in 1959. At equilibrium prices for milk and with $14.50 or $16.00 hogs, further expansion of the farm business is limited by the capital (including credit) restraint on about 60 percent of the strata. Many strata were programmed to use from 20 to 40 thousand dollars more capital in their optimal organizations than they used in 1959.

In the Northeast Region similar work has been initiated in cooperation with the State experiment stations of Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New York, Pennsylvania, and Vermont. A random sample of farms was surveyed in each State. Data obtained from these surveys have been summarized. Representative resource situations and input-output relationships for alternative crop and livestock enterprises are being developed. A linear programming model to utilize this information is nearly complete and suitable computer routines have been selected. Prices of milk and selected alternative products and factors will be varied to provide normative supply functions for each farm situation. These will be aggregated to form supply functions for each area, State, and the study area as a whole. Since the results will be combined with those of the Lake States study area, special care is being taken to ensure comparability of data and procedures.

D. Appraisal of Adjustments in Cotton Areas

Areas designated for detailed study, about 20 in number, have been delineated. Representative farm situations have been selected for all study areas. The development of input and output data for the adapted enterprises for each representative farm situation is essentially complete for all areas. These data have been published for several areas and are being used by the Extension Services and others engaged in individual farm planning.

The optimum combinations of enterprises, for several assumed price relationships, have been determined for practically all representative farm situations in all study areas.

Estimated area aggregates have been developed for selected products, and input items and for returns to land and management, by expanding from the results of the optimum combination of enterprises developed for the

representative farm situations by the linear programming process. These aggregates are available for the Delta areas of Arkansas, Louisiana and Mississippi, the Low Rolling Plains area of Texas and Oklahoma, the Black Prairie area of Texas, the Piedmont area of South Carolina and Georgia, a Coastal Plains area of Georgia, a Coastal Plains area in North Carolina, the Limestone Valley area of Alabama, and for some California areas. The aggregation phase is underway in all other study areas. A brief discussion of selected examples of some results of the study follows.

Optimum combinations of enterprises for a large-mixed-soil-farm in the Delta Area with five different prices of cotton are presented in Table 1. The prices of alternative products are held constant as follows: corn, $1.10 per bushel; soybeans, $2.25 per bushel, and rice at $3.80 per hundred pounds.

For this representative farm situation, the maximum cotton acreage permitted by the agronomic restriction is in the optimum organization with cotton at 26 cents per pound. But with the 20.8 cent price, the cotton acreage would be limited to the sandy soils. However, returns to land and management would be relatively low with cotton below 26 cents per pound.

Aggregates of selected items for the Delta Area, assuming five cotton prices and two levels of technology, indicate the following: As the cotton price is lowered, cotton production is not changed much until the price falls below the base price of $0.26. (See Table 2.)

With the present level of technology the second most important crop, acreage-wise is soybeans, at all price levels for cotton. However, as cotton prices are lowered the acreage devoted to rice steadily increases. No livestock is found in these aggregations. With advanced technology cotton production is not substantially reduced until the price falls below the base price. However, corn replaces soybeans to a great extent and rice again becomes an important crop at lower cotton prices. Hogs also come into the programs under these conditions and the numbers rise rapidly as cotton prices decline.

While acreages of cotton were not materially affected until cotton prices dropped below the base price, incomes were materially affected. Under present technology, with cotton at 20 percent below the base price (20.8 cents), returns were less than 40 percent of those obtained with a 26 cent price. With advanced technology, returns at all levels of cotton prices were considerably higher than returns with the present level of technology.

Additional aggregations, with cotton at the base price and with soybeans and feed grains prices allowed to vary 30 percent above and 30 percent below the base, indicate the following: With feed grain and soybean prices at 30 percent above the base, acreages of corn and soybeans are substantial and in each case greater than the acreage of cotton. However, when feed grains and soybean prices are 30 percent below base, these crops are completely eliminated from the organizations and rice becomes the major alternative to cotton.

For the Rolling Plains Area of Oklahoma and Texas, optimum enterprise combinations have been programmed for 10 representative sizes of farm-physical resource situations assuming 5 different cotton prices and 3 levels of

Table 1.-Farm Organization for maximum net returns, large-mixed-soils farm 1/, advanced technology, Delta areas

Item	Unit	Current cotton allotments	No allotments but cotton restricted to 60 percent of the total cropland for agronomic reasons				
Cotton prices	Cents	31.2	36.4	31.2	26.0	20.8	15.6
Cotton on loam soil	Acres	123	300	300	300	0	0
Cotton on sandy soil	do.	110	110	110	110	110	0
Total cotton	do.	233	410	410	410	110	0
Corn, clay soil	do.	246	0	0	0	0	0
Corn, loam soil	do.	187	10	10	10	310	249
Corn, sandy soil	do.	0	0	0	0	0	110
Total corn	do.	433	10	10	10	310	359
Rice-soybean rotation, clay soil	do. 2/	0	264	264	264	264	0
Rice-fallow rotation, clay soil	do. 3/	0	0	0	0	0	264
Rice-fallow rotation, loam soil	do. 3/	0	0	0	0	0	61
Total rice-fallow rotation	do. 3/	0	0	0	0	0	325
Soybeans, clay soil	do. 4/	18	0	0	0	0	0
Total crops	do.	684	684	684	684	684	684
Hired labor, skilled	Hours	6,558	10,112	10,112	10,112	6,245	5,580
Hired labor, unskilled	do.	4,222	5,600	5,600	5,600	1,982	0
Cotton production	Bales	329	542	542	542	182	0
Corn production	Bushels	23,471	650	650	650	20,150	25,095
Rice production	Cwt.	0	8,019	8,019	8,019	8,019	8,775
Soybeans production	Bushels	360	1,584	1,584	1,584	1,584	0
Gross returns	Dollars	84,892	136,275	121,439	106,602	67,419	60,950
Total expenses	do.	57,428	85,236	85,236	85,236	53,697	48,988
Net returns to land and management	do.	27,464	51,039	36,203	21,366	13,722	11,962
Tractor drivers required	Number	5	7	7	7	5	5
Operating capital required	Dollars	36,170	55,146	55,146	55,146	35,739	34,998
Capital investment in machinery and equipment	do.	43,770	56,474	56,474	56,474	28,924	34,484

1/ Total land, 1,200 acres; Cropland, 684 acres (264 acres clay; 310 loam; 110 sand).

2/ One-half rice; one-fourth fallow; and one-fourth soybeans.

3/ Two-thirds rice and one-third fallow.

4/ Does not include soybeans grown in rice rotation.

Table 2.- Aggregative normative supply response - Delta areas of Arkansas, Louisiana and Mississippi

Item	Unit	Current allotment 1/	Cotton price: 40 percent above base	20 percent above base	Base 2/	20 percent below base	40 percent below base
				Present technology			
				1,000 units			
Cotton	Bales	1,758	3,169	2,867	2,805	1,093	407
Corn	Bushels	---	---	---	---	---	---
Soybeans	do.	55,094	14,531	16,674	17,185	31,448	46,192
Wheat	do.	---	790	790	790	661	124
Rice	cwt.	---	22,629	27,174	27,516	49,723	50,033
Hogs	do.	---	---	---	---	---	---
Beef	do.	---	---	---	---	---	---
Net returns 3/	Dollars	99,826	239,444	158,895	83,172	31,970	20,498
				Advanced technology			
				1,000 units			
Cotton	Bales	2,647	3,929	3,929	3,275	1,670	7
Corn	Bushels	149,137	45,970	46,238	51,695	122,438	167,727
Soybeans	do.	15,572	7,731	7,838	9,469	12,618	7,317
Wheat	do.	---	---	---	---	---	---
Rice	cwt.	---	28,354	28,630	35,021	37,676	56,523
Hogs	do.	173	2,075	2,075	4,295	7,700	8,004
Beef	do.	56	115	69	65	---	---
Net returns 3/	Dollars	206,105	383,693	280,043	180,090	104,210	92,584

1/ Rice excluded.

2/ Assumed base price of 26 cents per pound of lint.

3/ Net returns to land, family labor and management.

wheat, feed grain, and livestock prices. The results of these programs have been expanded to the area represented by these farm situations. Estimates, based on previous research, were made of production from resources in the area but not represented by these 10 situations. Estimated aggregates of specified items for the entire Rolling Plains area are shown in Table 3.

The "normative" response of cotton production to change in prices of cotton and grain is highly elastic over a relatively narrow range of prices. With grains at base price (wheat $1.25 per bushel and grain sorghum $1.70 per hundredweight), the major change in cotton production occurs between 17.6 and 22 cents per pound for cotton. Whereas with grain prices at 130 percent of base, the major change occurs between 22 and 26.4 cents per pound for cotton. In each case, very little cotton would be produced at the lower cotton prices and approximately the agronomic limit to acreage would be reached at the higher price.

For the Piedmont area of South Carolina, optimum farm organizations were determined by linear programming for 4 representative sizes of farms with variable cotton prices ranging from 15.6 cents to 36.4 cents per pound of lint.

Various combinations of resident labor such as one-man equivalent, one-man equivalent minus 45 hours per week, two-man equivalent and three-man equivalent were programmed. Under the assumed conditions, grade A dairy, poultry, and peaches showed up as the most profitable enterprises on all sizes of farms. By deleting all of these specialty enterprises except one and finally all of them together, optimum organizations were determined for other alternative farming systems. Where all of the specialty enterprises were excluded, beef yearlings became a major enterprise. This beef cattle system is based on producing about 465 pounds of gain on a 420-pound yearling, purchased in the fall and fed on Coastal Bermuda pasture and hay, and sold the next fall.

With dairy, poultry and peach enterprises excluded and with the base price of 26 cents for cotton, the optimum organizations did not include cotton on any size of farm. At low cotton prices the "planted pine" trees were included in most optimum organizations.

In arriving at estimates of area aggregates, the land reported in farms in the 1959 Census of Agriculture was used as a preliminary base. Excluded from this base was the land reported in vegetables for sale, land in tree fruits, nuts and grapes, land in farms with less than 10 acres of open land, plus two acres of pasture and hay crops per dairy cow for the number of dairy cows reported in 1959. The total acres of open land reported by the Census was 1,627,495. After the exclusion, the remaining acreage is 1,453,000 or 89 percent of the Census total. This acreage was distributed to the representative farm sizes based on data from a random sample of farms taken in 1958. The number of farms in each size strata was determined and these numbers were used to expand from the optimum organizations for representative farm sizes to the Piedmont Area of South Carolina as shown in Table 4.

A study of part-time farming in the Piedmont Area of South Carolina was completed with the publication of a bulletin "An Economic Appraisal of

Table 3.- Estimated aggregates for specified items, Rolling Plains Area of Oklahoma and Texas

Item	Unit	Price of lint cotton (cents per pound)				
		13.2	17.6	22.0	26.4	30.8
		1,000 units	1,000 units	1,000 units	1,000 units	1,000 units
70 percent feed grain and livestock prices: 1/						
Cotton production	Bale	108	1,683	2,260	2,522	2,522
Feed grain production 2/	Cwt.	41,810	11,391	4,359	3,591	3,591
Cattle numbers:						
Stockers	Number	364	109	45	35	35
Beef cows	do.	849	859	864	864	864
Labor hired	Hours	10,804	28,371	28,371	40,794	40,794
Net returns 3/	Dollars	55,754	69,191	114,868	166,648	219,809
100 percent feed grain and livestock prices: 1/						
Cotton production	Bale	35	275	2,080	2,374	2,473
Feed grain production 2/	Cwt.	44,249	39,848	9,389	3,516	1,315
Cattle numbers:						
Stockers	Number	1,501	1,481	729	624	581
Beef cows	do.	802	799	841	837	838
Labor hired	Hours	7,366	10,358	30,120	34,735	37,861
Net returns 3/	Dollars	121,885	123,998	152,051	200,197	251,315
130 percent feed grain and livestock prices: 1/						
Cotton production	Bale	13	45	457	2,123	2,292
Feed grain production 2/	Cwt.	51,629	51,983	45,695	14,205	10,411
Cattle numbers:						
Stockers	Number	1,718	1,654	1,540	885	733
Beef cows	do.	---	---	---	---	---
Labor hired	Hours	7,196	7,429	12,504	30,761	33,384
Net returns 3/	Dollars	198,725	199,111	205,826	241,487	289,102

1/ 100 percent grain prices: wheat, $1.25 per bushel; grain sorghum, $1.70 per hundredweight.

2/ Wheat converted to feed grain equivalents.

3/ Net returns to land, operator labor and management.

Table 4.- Estimated aggregate acreages, livestock numbers, labor requirements, and income with specified cotton prices, Piedmont Area, South Carolina 1/

Item	Unit	Price of lint cotton (cents per pound)		
		15.6 through 26	31.2	36.4
		1,000 units	1,000 units	1,000 units
Land use:				
Cotton	Acres	---	134	185
Wheat	do.	---	37	64
Lespedeza seed	do.	---	128	260
Coastal Bermuda				
Hay	do.	299	271	232
Grazing	do.	715	649	556
Idle cropland	do.	---	77	21
Loblolly pine (planted)	do.	283	---	---
Livestock:				
Beef yearlings	Number	1,664	1,510	1,293
Labor:				
Resident 2/	Hours	12,921	15,728	15,099
Hired seasonal	do.	5,117	7,862	9,888
Gross receipts	Dollars	311,426	311,018	292,491
Net returns to land, management and resident labor	do.	49,736	52,784	55,921

1/ Excludes dairy, poultry, fruits and other specialty crops and land in farms with less than 10 acres open land.

2/ 11,211 part-time farmers plus 8,035 full-time operators plus 1,132 annual workers.

Part-time Farming in the Piedmont Area of South Carolina." Results of the study indicate that one-fifth of the farmers in the Piedmont Area of South Carolina are part-time farmers. About four-fifths of these part-time farm operators performed some work off their farm during the year, and 88 percent of them were employed 200 or more days off their farms. Therefore, these operators had a very limited amount of time to devote to farming activities. The average size of part-time farms in 1958 was approximately two-thirds the average size of commercial farms in the area. However, more than one-third of the cropland on these part-time farms was idle. The average part-time farmer showed a net farm income loss of $137 in 1958. While livestock enterprises on these farms were usually small, there is a trend toward more livestock production, particularly for the owner and part-owner groups. Nonfarm employment of part-time farmers was heavily concentrated in the operative and craftsman type jobs. Income from off-farm employment averaged slightly over $2,500 per worker in 1958. The annual cost of transportation to the off-farm job averaged about $400.

A study of adjustments in irrigated crop production in the Upper Texas Panhandle was continued. High costs of irrigation water, decrease in wheat acreage allotments, and lower prices for grain sorghum emphasize the need for an economic evaluation of irrigation under these changed conditions. Cooperating farmers who were interviewed in 1960 were interviewed again in 1961 and 1962. Information pertaining to water use, crop production practices, and crop yields was obtained. During the last 2 years the importance of wheat pasture has increased and a considerable acreage of wheat has been seeded for pasture only. The feed-grain programs and the prospects of further reduction in wheat for grain acreage may result in still further increases in the acreage planted for pasture. Field work on this project was completed in 1962.

E. Appraisal of Adjustments in Wheat Areas

A study of adjustments and potential adjustments in wheat farming is being made in North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Colorado, Montana, Idaho, Washington, and Oregon. These studies have accumulated extensive data on the production situation on typical wheat farms in the Great Plains and the Pacific Northwest. Data are being assembled on costs and on comparative net incomes from wheat and alternative crops under various prices and programs, area by area. These data are basic to the analyses of the impact of different kinds of adjustment programs on the production and income of individual farms, and to the aggregative effect of such adjustments.

Data and analyses from the wheat adjustment studies in Oregon, Washington, Montana, Kansas, Colorado, and Oklahoma were used to analyze how wheat farmers would adjust to different wheat programs that have been proposed for solving the wheat problem. If wheat acreage allotments were reduced 25 percent and the price raised to 85 percent of parity, net incomes would be slightly higher on most study farms than under the present program. Wheat production on each representative farm studied would decrease 25 percent. Total grain production (wheat plus all feed grains), however, would change very little on all farms studied except in northwest Kansas and in Colorado. In these two areas, total grain production would increase 11 percent and 16 percent respectively.

With allotments increased 20 percent and wheat prices reduced to 65 percent of parity, net incomes would be reduced 8 to 25 percent. Wheat production would increase about 20 percent, but total grain production would change very little. Under a program with marketing allotments for food wheat and export wheat, price supported at 65 percent of parity and an 80-cent a bushel payment on the food wheat quota, and 20 percent of the wheat base acreage in a land reserve, net incomes would increase on all farms; 15 percent or less on the Kansas study farms, 20 to 25 percent on the Colorado and northeastern Montana study farms, and 34 to 39 percent on the Oklahoma, north central Montana, Washington, and Oregon farms. Total wheat production would decrease on all study farms except those in Kansas and Colorado. With a program of marketing allotments on food wheat price supported at 90 percent of parity, net incomes would fall 11 percent on the representative northwest Kansas farm, increase 9 to 19 percent on the representative Montana, Washington, and Oregon farms, and remain unchanged on the other farms studied.

With no production controls and no price supports, net incomes would decrease on all study farms: Least (-19 percent) on the representative Washington farm, and most (-66 percent) on the representative Oklahoma farm. Wheat production would increase on all study farms except the northwest Kansas farm. Bushel allotment programs would tend to stabilize farm incomes over a period of years.

Conclusions drawn from the study may be generalized as follows: When acreage allotments are in effect, farmers grow the allotted acreage even though wheat prices are as low as 65 percent of parity; wheat at a feed price is more profitable than barley in the Northern Plains and the Pacific Northwest; in Kansas and Colorado, grain sorghum is more profitable than wheat at a feed equivalent price; the best income-producing crops other than wheat are feed grains on specialized wheat farms in both the Great Plains and the Pacific Northwest; wheat production would not decline but would continue for some time, even if the price of wheat were lower than any level now seriously considered because income would cover the direct expenses of production although return to invested capital would be reduced.

Data from these studies were also used to estimate the area and regional aggregative effects of production adjustments to different wheat programs. The study includes data for 65 adjustment areas in a total of 10 wheat producing States in the Plains and the Pacific Northwest. These States produce about 70-75 percent of the wheat in the U. S.

The results are not yet summarized except for Kansas. The Kansas results are:

Program	Allotment	Wheat price, % parity	Million tons: Wheat	Million tons: Feed grain	Million tons: Total grain	% wheat is of prog. A
A	1961 acreage	75	5.5	5.7	11.2	100
B	Acre - 25% less	85	4.2	7.4	11.6	77
C	Acre - 20% more	65	6.2	5.4	11.6	114
D	Bushel - Food Export (20% wheat base in CR)	100 65	5.3	4.4	9.7	96
E	Bushel - Food	90	5.5	6.2	11.7	101
F	None	None	5.3	6.5	11.8	96

Note: Wheat production decreases under programs B (reduced allotment), D (bushel allotment), and F (no production controls); it increases under program C (increased allotment). On the contrary, feed grain production increases under programs B, E, and F. Total grain production increases with all programs except D, in which some land retirement is mandatory. With acreage controls removed (programs D, E, F), a larger percentage increase occurs in the production of wheat in the eastern areas of Kansas and a smaller increase occurs in western Kansas. In eastern areas, wheat even at a feed price would produce more income than alternative crops, except corn.

In the Columbia Basin of Oregon, when wheat farms shift land to production of barley, as they must when acreage of wheat is restricted, the costs per unit of farm output are increased because resources are less efficient in producing barley than in producing wheat. Barley yields are also less dependable than yields of wheat. Analyses of the effects of different programs showed similar net incomes but much different amounts of wheat and barley produced. Improved technology (fertilizer and new varieties) have largely nullified the reductions in production sought by means of acreage allotments, i.e., total production on the present reduced acreage is nearly as high as it was 10 years ago. Work has begun on selecting wheat-livestock situations for study. Three publications describing the wheat production industry, analyzing the costs and returns in different cash-grain farming situations, and analyzing the impact of different wheat programs, were published during the year.

In North Dakota, an emerging new technology (mainly use of fertilizer on cereal grains) has necessitated a new look at yield projections, and subsequently some revised analyses of the economies of alternative farming systems. The study of representative farming situations has been expanded into another wheat area not previously studied, and manuscripts leading to publications are being prepared summarizing economic studies of beef cattle and hog enterprises on grain farms.

Work in South Dakota is just getting underway.

A manuscript summarizing the work thus far on profitable adjustments in south central Nebraska farms under alternative wheat programs has been written and is being readied for publication.

In Kansas and Colorado, surveys were made on a sample of representative farms to gather information on inventories, investments and expenses on tractors and farm machinery. Selected data summarized in Table 5 show that expenses per acre of cropland are higher in the annual cropping area of south central Kansas than in the crop-fallow area of northwestern Kansas, but on each acre in crops they would be somewhat lower. Expenses per acre decline with size of farm in northwest Kansas but they are about the same for all sizes of farms (on the average) in south central Kansas. It was observed that a higher percentage of the machines on the smaller farms were purchased "second-hand" than on the larger farms. In a survey of tractor expenses as shown in Table 6, it was found that expenses per hour of tractor purchased "second-hand" averaged about 42 percent as high as for tractors purchased new, and that the tractors purchased "second hand" were used 65 percent as many hours in 1960 as those purchased "new." A report containing all the findings of the machinery and tractor cost surveys is planned for publication during the coming year.

In Montana, economic analyses were made of five alternative production programs on four sizes of grain-livestock farms in three main wheat-growing areas. The alternatives were (1) wheat and barley, (2) wheat-barley-livestock, (3) wheat-Conservation Reserve-livestock, (4) Conservation Reserve-livestock, and (5) Conservation Reserve only. Results of the analyses are being published in three reports, each to serve a specific area of the State. Budget analyses of the 1961-62 farm program on a 450-acre cash grain farm indicated that net income was highest with the minimum participation allowable, i.e., diversion of 10 percent of the wheat allotment and 20 percent of the feed grain (barley) base to land retirement. Somewhat lower net farm income would result from 10 percent wheat diversion and no barley diversion, or 10 percent wheat diversion coupled with all barley diverted. Lowest returns resulted from diverting 40 percent of the wheat acreage and all of the barley acreage--an instance of maximum participation in the wheat and barley programs.

In the State of Washington, analysis was begun on the effect of wheat programs on production and income of farms in each producing area of the State. Preliminary results showed that programs have similar effects on farms of different size. Work has begun on a Station publication to report the results.

Dryland farmers could employ various management strategies more confidently if they could anticipate variations in weather and crop yields. In Montana, a significant effort in this regard was a study and trial application of the Markov chain theory. A basic assumption of this theory is that the probability distribution of an event in one time period is causally related to the state of that event in a preceding time period. This is a major departure from the usual assumption that events are randomly related over time. The Markov chain theory seems to apply to the analysis of wheat yields on summer-fallow, or in any area where rainfall one year has a strong influence on yield the next year. In one set of data we found that if the wheat yield was low (4 bu.) this year, there was a probability of 0.135 of another low

Table 5.- Farm machinery expense by size of farm in Kansas, 1961 1/

Farm size group	Cropland per farm	Machinery expense 2/		Percent of machines purchased "used" 3/
		Total	Per acre	
	Acres	Dollars	Dollars	Percent
Northwest Kansas (crop-fallow area)				
2	264	1,399	5.30	61
4	512	2,239	4.37	50
5	861	3,503	4.07	29
6	1,131	4,474	3.96	32
7	1,624	5,607	3.45	25
8	2,464	9,304	3.78	19
South Central Kansas (annual crop area)				
1	137	1,039	7.58	60
2	256	1,944	7.60	46
3	370	2,844	7.60	41
4	520	3,848	7.40	27
5	859	6,392	7.44	29

1/ Data from 141 sample farms.

2/ Includes depreciation, repairs, insurance, interest, taxes and housing.

3/ Based on number of machines.

Table 6.- Annual expenses for tractors purchased new and those purchased used, Kansas, 1960 1/

Item	Tractors purchased NEW	Tractors purchased USED	USED as percent of NEW
Number in sample	321	291	N.A.
Price paid (adjusted to 1960 level)	$ 4,444	$ 1,351	30
Average size (plow bottoms)	4.1	3.3	80
Estimated life (years)	14.2	10.4	73
Years used	8.1	5.8	72
Age when bought (years)	0	8.8	--
Hours used in 1960	528	346	66
Expenses, 1960:			
Depreciation	$ 363	$ 145	40
Insurance	3	1	33
Housing	28	8	29
Taxes and interest	178	54	30
Repairs	85	68	80
Total	$ 657	$ 276	42
Costs per hour:			
Actual use in 1960	$ 1.24	.80	65
If used 300 hours yearly	2.19	.92	42
If used 500 hours yearly	1.31	.55	42

1/ Northwest and South Central Areas combined.

yield next year and 0.243 of a high yield. If the yield this year was high (20 bu.), the probability of another high yield next year was 0.471, whereas the probability of a low yield next year was 0.033. Results of probability analyses can be used to develop management strategies including use of reserves, credit, and crop insurance, and the capital replacement of farm machines. Some of the analyses were published in an article in "Agricultural Economics Research" for April 1962. A paper was also presented to the Committee on Economics of Range Use and Development of the Western Agricultural Economics Research Council in 1962. A manuscript "Studies in Yield Variability" has been approved for publication as Montana Technical Bulletin No. 575. Another manuscript "Management Strategies for Variable Wheat Yields in Montana," aimed at practical farm manager readers, has been prepared.

F. Appraisal of Adjustments in Rice Areas

The major southern rice producing areas have been delineated. They include the Grand Prairie and the Northeast Terrace areas of Arkansas, the Central Delta area along the Mississippi river in Arkansas, Louisiana and Mississippi; the Southwest Louisiana rice area; and the Coast Prairie areas in Texas. The total land resources suited to rice production and their present use has been determined for all areas. The estimated number of farms by size groups has been determined for the Arkansas and Mississippi areas, and data which will provide farm size distributions have been compiled and are now being analyzed for the Louisiana and Texas areas.

Input and output data reflecting both present and advanced levels of technology have been developed for the adapted enterprise for each major soil-size of farm situation in the Arkansas and Mississippi areas. Similar data have been developed for present technology for the Louisiana and Texas areas. The effect of advanced technology is now being analyzed.

A set of product and factor prices has been developed for use in evaluating alternative farming systems.

Although the study has not progressed to the report stage, the input and output data developed for the two levels of technology for the adapted farm enterprises are being used by Extension Service personnel in their individual farm planning work with rice farmers.

G. Appraisal of Adjustments in Feed Livestock Areas

A study of the effects of alternative levels of grazing fees and privileges on ranch organization and net returns in public land areas was started. Considerable progress has been made on this study to evaluate the economic effects of alternative levels of grazing fees and privileges on the organization and net returns of various sizes and types of cattle and sheep ranches that include the use of public grazing lands administered by the Bureau of Land Management and the Forest Service. On large areas of public land under the administration of the Bureau of Land Management and the Forest Service, grazing of livestock is permitted on a grazing privilege or lease basis to livestock operators. It is the responsibility of the administering agencies to establish reasonable fees for use of the forage and to make grazing allotments to livestock producers that will conserve the range resource.

There is a close economic relationship between permitted rate of use and fees charged for use of public grazing land. The Bureau of Land Management and the Forest Service are particularly interested in a current research evaluation of the impact of changes in grazing fees and privileges on ranch organization and income in view of the President's directive in his special message on natural resources to determine fair user charges. The two agencies jointly requested the Farm Economics Division to study representative ranch situations throughout the area of public grazing lands. The study has an important bearing on what action the agencies might take in response to the President's directive. Economic effects were studied of charging fees of 60 cents or $1.00 per AUM compared to the 1961-62 fee of 20 cents on BLM land; and of charging fees of $1.00 or $1.40 per AUM compared to the 1961-62 fee of 60 cents on FS land. Results of the study are being summarized in a report for publication.

Adjustments in range management associated with range and pasture improvement practices in California are being studied along three fronts. Studies on the economics of fertilization are to learn the effects on plant growth, palatability, and yield. Most pastures must be fertilized to maintain a proper balance between legumes and grasses in the sward. Legumes improve the nutritive value of the forage and help maintain the nitrogenous fertility of the soil. Nitrogen is best applied at frequent intervals through the season, whereas phosphorous and potassium, being more stable, can be applied in larger doses less frequently. Nitrogen fertilization is unnecessary on sites with a 30-inch rainfall. These pastures should have a higher percentage of legumes, which can be achieved by phosphate fertilization.

Studies on range improvement and ranch management are to learn the economics of brush control (through chemical spray or controlled burning), reseeding, and ranch reorganization. It is more economical to follow a successful burn with a chemical spraying (the second or third year), than to "reburn." Burning is more successful if the brush is first "mashed" down. Grazing is to be avoided on treated areas for a few seasons to permit grasses to become reestablished. Studies of ranch organization and management reveal that savings in per-unit costs on the larger ranches are due to more effective use of labor, and because fixed costs do not increase in proportion to cattle numbers and size of ranch.

Economic measurement of range improvement practices is the main objective in a study of economics of feed and forage production and utilization in eastern Oregon. Representative ranches using, in common, units of public grazing land under jurisdiction of the Bureau of Land Management (BLM) will be studied by means of linear programming, to see what range improvement practices or combination of practices will pay. The work was begun late in the reporting year.

Economics of adjustments to range improvement practices has been under study in New Mexico. The main question is whether improvement practices will pay. A related question is the influence of public aid on economic returns from

improvements. Preliminary findings for small- and medium-size cattle ranches in northeastern New Mexico are as follows:

	Small ranch (113 beef cows)	Medium ranch (368 beef cows)
Total investment	$ 61,960	$ 330,914
Net ranch income:		
Total	4,537	15,032
Av. per cow	40.15	40.85
Labor income (allow 5% int.)	1,475	-1,514
Return to capital and mgmt. (allow $3,000 operator's wage)	2.48%	3.63%

It would take the cumulated compound returns from two cows for 11 years to exceed the cumulated compounded costs of a 2,000 cubic yard reservoir for stock water; returns from two cows for 15 years to cover the costs of a mile of fence.

Studies in Arizona, Colorado, and Nebraska provide information on adjustments in beef cattle fattening in the West. The cattle feeding industry is expanding rapidly in the Western States and it is concentrating more and more in large feeding yards. In the older feeding areas, such as the South Platte Valley in Colorado and in Nebraska, this trend raises the question whether traditional family-farm type feeding can continue to compete and prosper. Whatever the answer, adjustments in traditional farming can be expected. In the newer areas such as Arizona and California, large-scale feedlots are developing where there has been no history of on-farm feeding. One question here is whether livestock feeding here may become feasible for the family farm. A central economic question in all areas of the project is the relative economic efficiency and competitive strength of large-scale and small-scale feeding enterprises.

The population of California, Arizona, and adjacent States has been increasing rapidly in recent years. Cattle feeding in Arizona and California has been increasing more rapidly than the human population and still these States are deficit in fed beef. The reason for this is an increased demand for high quality fed-beef in a region that traditionally has seemed to prefer grass-fattened beef. Since World War II, fed beef has replaced the nonfed in the West more rapidly than elsewhere in the U. S. Also, since World War II the production of feed grains and forage crops has expanded rapidly in the West but Arizona and California still import feed grains. So, the prices of both beef and feed grains in the West are higher than their counterparts in the Corn Belt and the Plains. Within this economic setting cattle feeding is expanding and apparently with considerable success in Arizona. Incompletely analyzed results of the study indicate a higher average feeding (feed conversion) efficiency than in the Corn Belt, which may be due partly to the milder climate of Arizona and partly to the larger scale of the feeding lots. The Arizona operators import poorer quality (hence cheaper) feeder cattle from Texas, Oklahoma, and southeastern States and which are in less demand for Corn Belt feeding. Specialization in crop farming is widespread in Arizona. There seems to be no more

likelihood for a complementary relationship to develop between crop farming and cattle feeding than between crop farming and dairy, or hogs, or poultry, of which there is very little in Arizona.

Of all cattle fed in the South Platte Valley of Colorado, the number of cattle fed in commercial lots (500 head or more) has increased from 40 percent in 1953 to 70 percent in 1962. The fastest growing group of feedlot operators are those feeding 500 to 2,000 head a year. The feed-conversion ratio is considerably lower for the farmer feeders than for the commercial feeders, but a part is due to the relatively high roughage ration of the farmer feeders. A paper "The Impact of Supermarkets, the Packing Industry, and Commercial Feeding on Great Plains Ranching" was presented at a symposium on ranching at Bozeman, Montana, in May, 1962.

In Nebraska, the trend to larger, more specialized cattle-feeding operations has resulted in an actual decrease in proportion of small feeders (0-49 head) and a marked increase in medium-sized lots (50-499 head) and large lots (500 + head). These two size groups now feed 72 percent of all cattle fed in Nebraska, whereas 10 years ago they fed only 56 percent. A report describing the cattle feeding industry in Nebraska has been prepared and is being reviewed for publication by the Nebraska Experiment Station.

Information on fallow and other practices was obtained from 50 farmers in the Hardlands of the Southern High Plains of Texas for an economic appraisal of soil, water, and crop practices on farm and ranch lands in the 17 Western States. The farms were located in the same area in which experiments on fallow had been conducted for 14 years by the Soil and Water Conservation Division of ARS. A manuscript is in preparation showing the effects on income of the variation and level of yields from using fallow, continuous wheat or sorghum, and a combination of fallow, wheat and sorghum. The farm data are being used in conjunction with the experimental data in interpreting the effects of fallow over the 14-year period. Somewhat different capital resources and living standards are necessary when utilizing fallow in the cropping system. Only about a third of the farmers used fallow, and these were the older age group. Credit seems to have played a very minor role, if any, in the plans of the 50 farmers with respect to their use or non-use of fallowing. Crop yields necessary to cover preharvest, cash expenses of production are: continuous wheat, 1.5 bushels; sorghum (in a wheat-sorghum-fallow rotation), 3.3 bushels. Yields necessary to cover fixed expenses are:

Rotation	Crop	Yield
Continuous wheat	Wheat	3.7 bu.
Wheat-sorghum-fallow	Wheat	5.3 bu.
Wheat-sorghum-fallow	Sorghum	7.9 bu.
Continuous sorghum	Sorghum	5.8 bu.
Wheat fallow	Wheat	6.4 bu.

Average returns to labor and management on a 1,280-acre farm in the Pullman soil area of the Southern High Plains of Texas for yields in the period 1943-56 were as follows:

Continuous wheat	$ 7,171
Wheat-sorghum-fallow	6,727
Continuous sorghum	6,572
Wheat fallow	5,917

Information on the investments, operating costs and annual use of tractors and farm machines in eastern and south central Nebraska was obtained on representative farms, to replace older data now considered obsolete. One manuscript "Cost of Operating Tillage and Harvesting Machinery in Nebraska" has been prepared, and another, on tractors, is planned.

A new project was initiated to provide information and analyses that will improve the organization and operation of the irrigated and dryland farms and ranches in the area of the Belle Fourche Irrigation Project and the associated economy. Basic sources of data for the study are the experiments conducted at the U. S. Field Station at Newell, South Dakota. Planned experiments on irrigation were delayed until 1962 because of the shortage of water in the reservoir serving the Station. Data were collected during the year on the livestock-feed balance in the area. Analysis of fertilizer experiments on native range showed the following annual returns for a 3-year period (1957-59):

Pounds of nitrogen applied	Average annual return
0	$ 1.73
40	2.25
80	2.03
160	1.03

Applications of phosphate ($P_2 O_5$) showed a net economic loss in each instance.

Work neared completion on a study of the long-term outlook for Western agriculture. The study describes sources of past changes in output, and projects western production for 1975.

The results to date may be summarized as follows: (1) Total crop production is expected to increase as much as 50 percent between 1959 and 1975. As total acreage of cropland is expected to increase by only 3 percent, this change will be due chiefly to an increase in overall crop yields. The greater yields are expected to arise from an increase of 18 percent in irrigated cropland, more efficient use of irrigation water, and greater use of fertilizer, plant pest control, and improved varieties of plants. (2) Roughly a third of the 4.4 million acres of new irrigated land that will come into

production between 1959 and 1975 will be capable of growing a wide variety of crops. The crop patterns on this land will be flexible, permitting land to be shifted readily from one crop to another in accordance with future local and national needs. Vegetables, fruits, and high-value field crops would be predominant crops on this land. About half of this new irrigated land will be capable of growing a fairly wide range of crops but its use would be somewhat more restricted than that of the land previously described. The remaining acreage will be capable of growing only a limited number of crops. Its use will be somewhat inflexible, being restricted generally to grains, forage crops, potatoes, sugar beets, beans, peas, and seed crops. (3) Non-forested grassland is estimated to increase by almost 600,000 acres by 1975. Six of the 11 States will increase their grassland area by 2,235,000 acres; 5 will decrease theirs by 1,642,000 acres. The Pacific Region will increase its grassland by about 300,000 acres; the Mountain Region, by about 293,000 acres. (4) By 1975, all pasture and rangeland in the West is expected to increase its productive capacity under normal attainable conditions about 80 percent over what it was in 1950. Pasture and rangeland in the Pacific Region has greater possibilities for improvement than rangeland in the Mountain Region. Carrying capacity of pasture and rangeland in the Pacific Region will increase almost 140 percent over 1950; that of the Mountain Region from 50 to 60 percent. Increases will result from clearing of trees and brush, removing other undesirable plants, control of insects and rodents, reseeding, fertilizing, rotation grazing, seasonal management, and water spreading.

Preliminary results of the study of alternative hog systems in Illinois indicate that on-farm feed processing provides farmers with an opportunity for reducing costs through lower processing costs and volume purchases of low-cost protien supplements. Barn-cleaning operations and manure disposal consume about three-fourths of the total labor input for finishing hogs in the average confinement set-up. Cost comparisons indicate that the average producer who handles manure as a liquid would gain by discarding it in a manure lagoon instead of storing and later spreading it on the land.

Work on the regional study of supply response and adjustments for hog and beef cattle production in the Corn Belt is being coordinated through the NC-54 Technical Committee and has been directed toward development of the specific study procedures and compilation of the basic data needed for the analysis. Random sample surveys of the commercial farms located within the study area have been completed in most States participating in this project. The programming model by which the analysis is to be carried out has been designed and the bulk of the necessary input-output data has been compiled. The work on this project has not as yet progressed to the stage where results are available specifying the nature of the supply response and adjustments which would be optimal to product price changes.

H. Appraisal of Agricultural Policies and Programs

The work in farm program appraisals draws on the results of many individual adjustment studies discussed in other parts of this report; such studies are not identified in the discussion that follows.

1. Adjustment opportunities on commercial farms. Farm economists in the Department have taken a broad view of the current situation in agricultural

production and of the prospects for the 1960's for a general background against which to examine alternative adjustment opportunities on commercial farms. This analysis was published as Agricultural Information Bulletin 239, "Farm Production Trends, Prospects, and Programs." As farm output has continued to expand despite low incomes, falling prices, and burdensome carryover stocks of some crops, individual farmers frequently can and do adjust to the situation largely by adopting improved technology and increasing the sizes of their farms. As farms become larger and fewer, labor leaving the farm is more than replaced by equipment and materials such as fertilizers. Migration of labor from farms has neither reduced the acreage of cropland in cultivation nor slowed down the rate of increase in farm output.

The prospect for the 1960's is for excessive farm production unless measures are taken collectively by farmers with Government help to curb production. A growing population and high levels of exports are not likely to offset continued increases in yields of crops and livestock. In the aggregate, surplus capacity may be about the equivalent of 15 to 20 million average acres of cropland by 1965, exclusive of some 13 million acres of cropland that will remain in the Conservation Reserve at that time.

2. Appraisal of alternative wheat programs. A study was made in eight specialized wheat areas of the Great Plains and the Pacific Northwest to determine the effects of alternative wheat programs. If acreage allotments were removed and wheat was at a nonsupported price of $1.25 (U.S. average), incomes of representative wheat farmers in the areas studied would fall 20 to 65 percent. Incomes would also fall (about 25 percent) if acreage allotments were increased a fifth and the support price of wheat were lowered from the 1960 level of about $1.80 to $1.56 per bushel. Incomes would increase slightly if acreage allotments were reduced a fourth and the wheat support price were raised to $2.04. Incomes would improve the most if: Food and export wheat were supported at $1.56; an 80-cents-a-bushel payment were made on a domestic food quota; and 20 percent of the wheat base acreage were retired at the 1960 rate of Conservation Reserve payments. Study results indicate: (1) Even at a feed price, wheat would pay better than barley in the Northern Plains and the Pacific Northwest, but would be less profitable than grain sorghum in the Southern Plains. (2) Feed grains, grown with the same equipment, are the most profitable alternatives to wheat. (3) Farmers would continue to produce wheat or other grains even if prices were much lower than they are now--returns would more than cover out-of-pocket costs. At any prices acceptable to most farmers, wheat and feed grain production can only be reduced by restricting acreages through some form of land retirement.

3. Economic effects of acreage control programs during the past decade. A comprehensive study of this subject was completed and a manuscript is being published. It shows that acreage allotments and marketing quotas did reduce output of crops to which they were applied, but diverted production to non-quota crops. Thus they influenced the total volume of crop production very little. Rising yields, however, were a much more important factor than land diversion in the expansion in production of non-quota crops. Yields per acre increased about as much for non-quota crops as for quota crops from 1952 to 1960. The Soil Bank programs kept crop production below what it would have been without them, and assisted farm people in making long-term

adjustments. Acreage control programs did not noticeably affect the quantities of purchased farm inputs nationally. Larger land retirement programs will be needed in the future if they are to be relied upon as a means of bringing crop production into balance with market outlets at prices considered acceptable by farmers.

Five reports dealing with the Conservation Reserve Program ("CR") in Georgia, Iowa, Maine, Nebraska, and New Mexico have been published. These reports present analyses of the characteristics and results of the Conservation Reserve Program in each of these States. In all areas, a large majority of farmers in the program had signed whole-farm contracts as compared with relatively few part-farm contracts. The proportion of CR farms with livestock was much smaller than the average of all farms in the respective States. This was true before signing contracts as well as afterwards. Operators of the CR farms were older, or more of them had off-farm jobs as compared with other farmers. Participation rose sharply in 1959-60, when payment rates were raised substantially, compared with participation in the first years of the program, 1956-58.

4. Special analyses of proposed and newly instituted farm programs. Several limited analyses were made. They include: (1) Effects of the proposed 1962 wheat program on income of representative farms in specialized wheat areas; (2) income and production effects of the 1961 Feed Grain Program on representative wheat farms; (3) labor and management returns per farm and per hour on four sizes of representative northeastern Montana specialized wheat farms under various program situations; (4) evaluation of the aggregative results of nine alternative wheat support programs; (5) analysis of methods for computing bushel allotments for alternative quantity-allotment wheat programs, and for computing wheat support prices at varying levels of parity for alternative farm programs; (6) analysis of the cost and benefits of a proposed general land retirement program.

5. Special study on sugar. Substantial contributions were made to a report prepared by a Special USDA Study Group on Sugar at the request of the House Committee on Agriculture. Considerable work was done in preparing analyses and material for the report.

6. Wheat farming in the Columbia Basin of Oregon. This study resulted in three publications on the character of specialized wheat farms in this area, costs and returns on these farms, and the impact of proposed wheat programs on a specialized wheat-summer fallow-farm in the area. The last of these studies considers five proposed wheat programs and compares returns to capital, labor and management under each of these programs with returns from no program. The programs considered include: (1) A wheat allotment equal to 65 percent of the wheat base acreage, the price of wheat supported at $1.79 a bushel and a free market price for barley at $0.87 a bushel. This was essentially the 1959 program. (2) The same as (1) with addition of payments for retiring cropland. (3) Wheat acreage reduced 20 percent below 1959 allotment with retirement payments applicable only to this 20 percent, the price of wheat supported at $1.91 a bushel, and the assumed free market price of barley at $0.87 a bushel. (4) No allotment, but 20 percent of wheat base acreage to be retired to qualify for payments of $0.80 a bushel on food-quota wheat, support price of $1.55 a bushel for the share of domestic food and export requirements, and an assumed $1.00 per bushel free

market price of all excess wheat. (5) Ten percent of wheat base acreage to be retired, support price of $2.27 a bushel for domestic food and export requirements, and $1.00 a bushel for excess wheat. Returns to operator labor and management would be highest, a little over $7,000 annually, under program (4), and except for the no controls or supports situation, it would be lowest at about $5,600 under program (1). With no controls or support, net farm income would cover less than half the charges for interest on investment and leave no return to operator labor or management.

7. Aggregate output response to alternative wheat programs. The aggregate supply response for eleven western States to six alternative government-support programs for wheat has been obtained. These estimates were developed by aggregating the response of various sized representative case farms in designated adjustment areas. The aggregates are now being checked for consistency prior to publication.

8. Land released from Conservation Reserve ("CR") contracts. About 550 farmers were interviewed in one county in Minnesota, two counties in North Dakota, and three counties in Texas. These counties represent areas of high concentration of CR contracts and have different types of farming. A nationwide mail survey of 150 ASCS county office managers has also been made. The surveys asked for expected use of land being released from contracts, response to signing new land retirement contracts, and the characteristics of the farms and farmers with expiring contracts.

County office managers responding to the mail survey expect that 45 percent of the 2.5 million acres released from CR contracts on December 31, 1961 will remain in grass and 55 percent will be cropped in 1962. Nationally, about 1.2 million acres (47 percent) of the land being released in 1961 have feed grain bases. About 30 percent of this is expected to be diverted under the 1962 feed grain programs, leaving more than 800,000 acres available for production of the three feed grains included in the 1962 programs. Another 160,000 acres of the land released were used to produce oats previous to contract. Nearly 300,000 acres (12 percent) of the land being released in 1961 has a wheat allotment. About 32 percent of this is expected to be diverted under the 1962 wheat program, leaving 200,000 acres available for wheat production. The 1961 released land included 87,000 acres of cotton allotments.

In five of the six counties studied in the personal interview survey, 55 to 90 percent of the farms and of the land being released from CR contracts in 1961 and 1963 were expected to be cropped. Feed grain production is expected to be the major use of land returning to crops. At annual diversion rates per acre equal to or slightly above those in existence under expiring contracts, the amount of land that farmers were willing to include under new land retirement contracts varied widely between areas, but was sizeable.

9. Appraisal of the 1961 Feed Grain Program. A study of about 600 participants in the 1961 Feed Grain Program and 600 nonparticipants, in Ohio, Minnesota, Iowa, Kansas, and Texas, shows that farms in the program were larger than other farms in their respective areas; that they had a higher proportion of the land in crops, and feed grain acreages comprised a larger proportion of total cropland; and that prior to 1961, more of the

cropland was used for such high-value crops as corn, grain sorghum, soybeans, and wheat. Participants had fewer livestock than had nonparticipants. There was little evidence of any difference in the productivity of cropland on farms in the program compared with those not in the program. The difference, if any, between productivity on individual farms of land retired under the program and that kept in production was small. The increase from 1960 to 1961 in the amount of fertilizer used per acre of corn generally was about the same for participants and nonparticipants, but because of the reduced acreages of corn or grain sorghum, participants used less total fertilizer on these crops in 1961 than in 1960, whereas nonparticipants maintained or expanded their acreages of these crops and greatly increased the total fertilizer applied. Compared with nonparticipants, participants were younger, had occupied their 1961 farms for a shorter time, and more of them had off-farm incomes. There was little difference in the amount of family labor available, or in the sources of off-farm incomes, although a slightly larger proportion of nonparticipants had incomes from pensions, social security, etc. The reasons given most frequently by farmers for participation were because it was more profitable, to improve (or rest) the land, to help reduce surpluses, to reduce risk, or to reduce costs. Reasons given most frequently for staying out of the program included: Because incomes would be higher; opposed to all government programs; they didn't understand the program; or because of criticisms of administration of the program.

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AREA NO. 2. ECONOMICS OF FARM MANAGEMENT AND CONSERVATION PRACTICES

Problem. There are marked differences among the major agricultural areas in the physical and economic environment which determine the possibilities and limitations on successful operation of farms. More information is needed for each type of farming region on the patterns of production resources and systems of farming used by individual farmers; the production requirements and output obtained from various enterprises with different methods of operation, including especially those practices that aid in soil and water conservation; the relationships between size of operations, combination of enterprises, production practices used, efficiency in production, and farm financial returns; and alternative opportunities for desirable adjustments, particularly those which conserve soil and water, on farms of different sizes, types, and physical conditions.

USDA PROGRAM

A continuing long-term program of research dealing with research-product relationships on samples of individual farms in representative farming areas is conducted in cooperation with State agricultural experiment stations. At Connecticut and New Hampshire, research emphasizes management problems and input-output relationships in the production of eggs and poultry meat. Dairy practices and most profitable organizations are emphasized in Minnesota. At Pennsylvania, input-output relationships are obtained for alternative production practices, and the relative profitability of these practices is determined under various resource and price situations. Cotton mechanization was studied in Mississippi. At Wisconsin, costs of installing and maintaining soil conservation practices were studied in the early part of the reporting period. Later, this effort was replaced by a study of the use of flood plain lands. Chief among the locations where emphasis is placed upon the economics of conservation practices as a part of the problem of farm adjustments are Georgia, Texas, Mississippi, and Pennsylvania.

A total of 6.4 Federal professional man-years is devoted to this area of research--2.5 man-years in resource product relationships; 3.4 man-years in the economics of conservation practices; and 0.5 man-years in program leadership. A Tennessee project on alternative levels of conservation, an Iowa project on obstacles to conservation, and a Wisconsin project on costs of practices were discontinued.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

Five projects--three in the North Central Region, one in the Southern Region, and one in the Western Region--are involved in the study of input-output relationships. One project in the Southern Region and another in the Western Region involve the intra-firm allocation of resources. Thirty-eight projects in the four regions deal with various aspects of the management factor in farming. Most of these are concerned with improving the decision-making environment through the development of decision-making guides, farm business analyses, and other information. However, a regional project in the North Central Region is concerned with the identification, classification, and

measurement aspects of the farm managerial input. Several stations are investigating segments of the conservation practices problem. These States include California, Illinois, Iowa, Michigan, Ohio, South Dakota, Tennessee, Texas, and Utah.

A total of 24.9 professional man-years is devoted to this area of research by State experiment stations.

Research by industry and other organizations is fragmentary in nature and is estimated to be equivalent to about 10 professional man-years.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Resource-Product Relationships for Farm Firms

The objective of a cooperative project in New Hampshire is to ascertain the most economically efficient systems of broiler production and marketing for various conditions. Flock-size bird growth, and seasonality-bird growth relationships have been determined. A manuscript reporting capital accumulation potentials has been completed, cleared, and now is in the process of publication. The report indicates a variety of sizes, combinations of payment rates, growth rates, flock numbers and the associated repayment periods.

In Connecticut, time and motion data for various production practices have been obtained from market egg producers. These data have been summarized and analyzed to reveal the influence of alternative production practices and specialized equipment on labor efficiency. A number of representative farms are being developed for Connecticut conditions. Linear programming techniques will be used to determine the optimal organization of these farms with a variety of production practices and price situations.

A continuing study of farm organization and management problems is conducted in Minnesota. This is a record-keeping project involving 179 farms in southeastern and 165 farms in southwestern Minnesota. The size of farm continues to increase in both areas as does the size of livestock enterprises. Specialization in livestock production is becoming increasingly evident in both areas as the average number of livestock enterprises per farm has decreased about 25 percent in the last 15 years. An annual report of the major findings will be prepared.

In Pennsylvania, major emphasis has been placed on the development of input-output coefficients for use in the construction of linear programming models. Coefficients have been derived for labor and machinery requirements for alternative crop and livestock enterprises--overhead labor used in different sizes of farm operations, feed requirements for dairy, beef, and hogs, and other cost data required for the development of partial budgets. Information obtained in a survey of two townships was used to test a value-measuring device concerning such matters as adoption of farm practices and attitudes about leaving agriculture.

A study of farm practices, located in Illinois, found that the change from conventional ear corn harvesting to field shelling is continuing at a moderate rate. From 1956 to 1961 the proportion of the corn crop in the States of Ohio, Indiana, Illinois and Missouri harvested by the three major

corn-harvesting methods changed from 95 to 86 percent for ear corn, 2 to 14 percent for field-shelled corn, and remained constant at 3 percent for corn silage.

There continues to be considerable interest in the use of the combine as a corn harvesting machine. There has been a doubling in the number of combines with corn head attachments being used from 1959 to 1960, and a decline in the number of picker-shellers and pickers being used. There is an increasing use of supplemental-heat driers as compared to heated-air and natural-air driers. In 1961, most farmers interviewed in Illinois were found to be using either concrete stave or glass lined steel silos for storing high-moisture corn. Galvanized steel silos were not being commonly used. However, in contrast, the new smaller volume glass lined steel bins were found quite frequently.

Farmers were found to be storing high-moisture corn in several forms: Ground ear, rolled ear, cracked shelled, rolled shelled, and shelled. Generally the ground ear corn was being stored in concrete stave silos and the shelled corn in glass lined steel silos or other bottom unloading structures. It was generally found that in the successful storage of high-moisture corn, management was a more important factor than the type of structure used. Observations indicated that corn can be kept in satisfactory condition in all of the structures used. However, the newly adopted airtight poured concrete silos with hopper bottom and auger unloader appear to keep shelled corn in better than average condition and are less costly than a concrete stave silo with top unloader.

In a study of the economics of mechanization on Mississippi cotton farms, preliminary results of one phase of the study dealing with methods of harvesting cotton indicate that more than 50 percent of the Mississippi Delta cotton crop was harvested mechanically during 1960 and 1961. Over 70 percent of mechanical harvesting is performed in a 4- to 5-week period. Hand harvesting is spread over a longer period. On the average, cotton picked by hand graded about 3.5 index points higher than machine-picked cotton. Further analysis of the relative efficiency of hand versus mechanical harvesting is underway. An analysis of custom machine work on Delta farms indicates that 93 percent of the farmers in a sample of large farms in the Delta hired custom machine work for an average of more than $1,000 per farm.

B. Economics of Conservation Practices

A Wisconsin study estimated the relative profitability of each of eight individual soil conservation practices as well as the aggregate profitability of several combinations of practices. Terracing provided the highest net farm income and interplanting the lowest. The difference between the two practices was $3,076. When five practices with the highest net income were used in combination, net farm income was $370 more than with terracing alone. Thus if a farmer found it more practical to use only one or two practices such as terracing or terracing and interplanting, he would not lose much in comparison with using several practices in combination. A publication entitled, "Relative Profitability and Order of Adoption of Soil Conservation Practices," is now in the process of publication. This line of work was discontinued as of August 1962.

A study of obstacles to soil conservation in western Iowa found that the significant obstacles were (1) operator's need for immediate income, (2) operator's failure to see the need for recommended practices, and (3) field and road layout of the farm. Characteristics which explained a significant amount of soil losses were (1) topography, (2) soil conservation district participation, (3) operator's ability to borrow funds for erosion control practices, (4) days of off-farm work, and (5) recognition of the seriousness of the erosion-control problem by farm operators.

A study of the changes in use of flood plain lands in Wisconsin watershed projects found that by the end of the 1961 crop year, approximately 250 acres of flood plain land had been converted from pasture to cropland or an average of 5.1 acres per farm. The original work plan provided for the conversion of 449 acres. Cash farm income "before" flood control averaged $6,054 per farm, leaving a net cash income per acre of $39. Farms averaged 66 crop acres per farm. The Soil Conservation Service estimated that each acre converted from pasture to cropland was worth $22. This was computed as the difference in net income return per acre between flood plain cropland and pasture. Significantly, net cash income per acre only increased to $41 by the end of the 1961 crop year or "after" flood control. This indicates that land converted on the flood plain, at least to the present date, had very little effect on the farm income. The greatest restraint was found to be the lack of crop acres in total farms averaging 187 acres per farm with 66 acres in cropland. Past research, coupled with the research findings of this study, points to the fact that farmers, where the Fayette soils are dominant, need at least 90 crop acres in order to operate efficiently. The study also revealed that converting acres from pasture to cropland on the flood plain may not always result in increasing total crop acres. It was significant that over the period from "before" to "after" flood control, average crop acres per farm actually dropped from 66 to 65 acres. This would imply that converting acres from pasture to cropland on the flood plain may not always result in more crop acres although such land might be badly needed. The increase may be absorbed by farming less on steeper slopes. It was found, however, that under higher levels of management and provided land resources were adequate, cash farm income could, in the future, be increased to more than $16,000, with an average net cash income per acre of $88 and a conversion value on the flood plain of as high as $62.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Resource-Product Relationships for Farm Firms

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B. Economics of Conservation Practices

None.

AREA NO. 3. STRUCTURE OF AGRICULTURE AND ECONOMICS OF FARM SIZE

Problem. The approximately six million farms that composed American agriculture in 1940 are being rapidly reorganized into larger and fewer farms. From 1949 through 1959, all farms--both commercial and noncommercial--declined 25.3 percent, from 4,282,000 to 3,704,000. During the same 10-year period all commercial farms declined by 26.3 percent, from 3,279,000 to 2,415,000. The decrease among total number of farms was among farms producing less than $10,000 worth of marketings, as there was a 64.3 percent increase in farms producing $10,000 or more sales. The radical change in the structure of American agriculture generates fundamental questions on which understanding and quantitative information are much needed by farm people, farm leaders, and farm policy makers as well as the public at large.

USDA PROGRAM

One of the changes in the structure of American agriculture in recent years has been the increase of vertical coordination or vertical integration. Basic analysis of vertical coordination in agriculture describes existing forms of vertical coordination, appraises their respective characteristics, and suggests lines of needed research. Several applied projects in other research areas examine vertical integration, contracting, and other means of coordination for particular commodities. These include a study of legal-economic aspects of contract production in farming being carried on under a research contract with the Agricultural Law Center at the State University of Iowa (Area No. 11); and projects conducted with North Dakota (Area No. 11), Tennessee (Area No. 14), and Mississippi (Area No. 4), on coordination phases of sugar beets, hogs, and eggs.

The position of the family farm in the new system of larger farms is being appraised. Examination is also being made of important beliefs and values that are affecting the implementation of economically feasible adjustments in agriculture. This work is carried out in Washington, D. C., using census data and other information available from the U. S. Department of Agriculture and other government agencies.

Analysis is being made of the complement of resources needed to enable farm operators to have earnings comparable to those of workers with similar labor capacities. This study is being carried out for different types of farming in various regions. The work is being done in Washington, D. C., except that farm budgets are developed at various field locations.

Work is being conducted on resources used in farming as related to agricultural production and farm income, by geographic region and size of farm. The central objective is to determine and compare the earnings of land, labor and capital on farms of the same size in different regions and on farms of different sizes in the same regions. The analysis spans a period of 11 years, making use of census data for 1949, 1954, and 1959. The study deals with all farms in 10 selected regions and in the United States as a whole. The regions are located in the Southern Appalachians, Southeastern Piedmont, Central South, Northern Lake States, Central Corn Belt, Southern Corn Belt, and the

Missouri-Arkansas hilly area. The work on this study is being carried out in Washington, D. C. in cooperation with Iowa State University.

Another main line of work now underway is a study of what levels of efficiency are associated with different sizes of farms of different types in major farming areas. The problem is being approached in two ways. The correlation between farm sizes and their total cost per dollar of output will be described through use of census data. This work will be done entirely by the staff in Washington, D. C. Using standardized input-output relationships, the second approach determines the causal relationship of change in farm size and total cash per dollar of output. This is done through development of farm budgets for major types of farms at various field locations. The following types of farms and areas have been tentatively selected for carrying out this work: Dairy farms - Massachusetts, Minnesota; wheat farms - Montana, Washington, Kansas; cotton farms - South Carolina, Mississippi, Texas, and California; beef raising - New Mexico, Tennessee; beef fattening farms - Illinois; beef feedlot fattening - Arizona, Colorado; hog-corn farms - Indiana; broiler farms - Georgia, Missouri; poultry farms-table eggs - Connecticut; tobacco farms - North Carolina; fruit and vegetable farms - Florida; apple farms - Washington, New York; potato farms - North Dakota. Underlinings indicate research that has already been initiated.

A total of approximately 11.5 Federal professional man-years has been devoted to this research area: Vertical integration, 3.0 man-years; economics of farm size and numbers of farms, 7.3 man-years; and program leadership, 1.2 man-years.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

In the Northeastern Region, Station studies are being made of existing contractual agreements, the functions performed by integrating agencies, and the effect upon the production and marketing of food and the income of farmers. Studies to determine the optimum size of dairy farms for efficient and profitable production are being conducted in the Northeastern Region.

Studies of changes in the character of the farm and factors affecting individual earnings, marketing and production economies related to size of the poultry business, and probable opportunities in farming (both full time and part time) as a result of urbanization and farm consolidation are being made in the North Central Region. Economic evaluation of certain strategies in management is being conducted by another North Central State. Likewise, an economic appraisal of the soybean industry is being conducted by the Minnesota station.

Other problems such as weight regulations of trucks in relation to the dairy industry, and the changes in exports over the last 30 years and reasons for changes along with their impact on agriculture are being studied in the North Central Region.

A total of 10.1 professional man-years is devoted to these studies by the State agricultural experiment stations.

So far as known, no work is being done in this area by private industry or other organizations.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Vertical Coordination

In the Pioneering Research Group, basic analysis outlining the scope of the field covered by vertical coordination was pursued. This brings together a general framework describing alternative kinds of vertical coordination and focusing the applicable economic theory.

A bulletin manuscript entitled, "Vertical Coordination in Agriculture," was submitted for USDA publication. This manuscript develops a theoretical framework for further analyses. It also surveys the extent of, and trends in, various kinds of vertical coordination in farming, and outlines needed areas of applied research.

A special study was undertaken of changes in coordination in cattle feeding. This analysis centers around the key firm of the custom feedlot and its relationships with farmers, ranchers, packers, feed manufacturers, and other firms. An important source of new information was a mailed questionnaire sent in February, 1962 to 35,000 cattle feeders with the cooperation of the Statistical Reporting Service. About 10,000 usable returns were obtained. The data were edited, coded, punched on cards, programmed, and delivered to the electronic computer system for analysis in May, 1962. Tabulations were expected in June, but delays related to moving offices of computer personnel, installing new machines, and re-schooling computer technicians intervened.

When the tabulations become available it will be possible for the first time to get a more accurate picture of the coordinating relationships between custom feedlots and other production and marketing elements. These findings will furnish basic data for other studies of cattle production and marketing.

A paper, "Changes in Coordination of Cattle Feeding," was delivered at the annual meeting of the Western Farm Economics Association at Reno, Nevada in August, 1962. Another paper was delivered at the annual meeting of the Western Economics Association at Los Angeles, also in August, 1962.

The contract study undertaken by the Iowa Agricultural Law Center at the State University of Iowa on legal-economic aspects of contract farming is discussed under Area No. 11.

A North Dakota bulletin giving the results of a study of contract farming and farm tenure on sugar beet farms in that State is listed under Area No. 11.

The results of a study of hog contracting in Tennessee are discussed under Area No. 14.

The work on contract egg production in Mississippi is reported under Area No. 4.

B. Economics of Farm Size and Numbers of Farms

The first stage of investigations of family and larger than family farms and their relative position in American agriculture was reported in Agricultural Economic Report No. 4, issued by the Department in January, 1962.

Family farms were recognized as businesses in which operating families were risk-taking managers who do most of the farm work. Larger than family farms were considered businesses in which most of the labor was hired. As the labor supply of an average farm family is approximately 1.5 man-years, farms using less than 1.5 man-years of hired labor were classified as family farms, and those using 1.5 or more man-years were classified as larger than family farms.

If the family farm were losing its historic position as the dominant institution of American agriculture, we would expect at least three types of changes to be underway. (1) Hired labor would be a significantly increasing proportion of all farm labor. (2) Family farms would be accounting for a decreasing proportion of all farm marketings. (3) Finally, family farms would be an increasingly smaller proportion of all farms, especially among the larger economic size groups. But the study found that none of these trends are underway.

The proportion of farm work done by hired labor declined slightly--it was 24 percent in 1959, as compared with 25 percent in 1948. Family farms accounted for more than 74 percent of total farm marketings in 1954 as compared with nearly 67 percent in 1944. Family farms accounted for 96 percent of all farms in 1954 as compared with 95.2 percent in 1944. Much more significant is the fact that family farms accounted for 75 percent of all farms with $10,000 or more of marketings in 1954 as compared with 69 percent in 1949.

In the course of this study, a valid procedure was developed for measuring change through time of the proportion of total farm work done by family labor and by hired labor, respectively. In making these measurements, it was discovered that on farms which accounted for 95 percent of total production, family labor decreased at a much slower rate than hired labor. This means that the decrease in the number of family workers during the 1950's is accounted for almost entirely by the very large decrease in the number of very marginal farms which accounted for less than 5 percent of all farm marketings in 1959. These findings are scheduled for publication in the November issue of the Journal of Farm Economics.

Investigations are now underway which will give a much more complete description and analysis of businesses comprising American agriculture than was possible in Agricultural Economic Report No. 4.

Resource requirements for operator earnings of $2,500, $3,500, $4,500, and $5,500 were budgeted for 8 types of farms in 15 areas. The budgets describe resource requirements for efficiently organized farms making full use of improved practices and available technology at 1959 cost rates and prospective prices. The budgets, which characterize rather closely the more progressive and adequate-size farms, do not necessarily describe current production and income relationships on average or typical farms.

Some especially significant findings of the study were: (1) Average gross sales on the 15 farms studied were $26,800 for operator, labor and management earnings of $2,500. (2) The least amount of gross sales required for $2,500 operator earnings was $9,275. (3) In 5 of the 10 States for which comparisons were made, two-thirds of the farms of similar types as the budgeted farms had less gross sales in 1959 than farms budgeted for operator earnings of $2,500. (4) Capital investment required for the budgeted farms averaged $57,000 for operator earnings of $2,500; and $111,000 for operator earnings of $5,500.

When these findings are related to trends in farm sizes, we may infer that in general, farms with less than $10,000 gross sales are inadequate to cover expenses and provide an acceptable level of living, for these trends show that farms with marketings of less than $10,000 are rapidly declining while those with more than $10,000 marketings are increasing even more rapidly.

Work on the study of resource productivity and farm income has included development of techniques for obtaining comparability of the 1959 and earlier census data; estimation of quantities for various inputs for which census data are not available; tabulation and aggregation of 1959 census data for regions; development of methods of analysis; computation of some rates and input-output relationships; and writing drafts of some sections of the report.

During the 11-year period studied there has been a rapid decline in numbers of small farms and an expansion in size of larger farms in the United States. This adjustment has been more rapid in regions of relatively low farm income. Where off-farm work has been available locally, small farms have not declined as rapidly. An increasing proportion of operators, both on large and on small farms, have some nonfarm employment or other sources of income. Only on the largest sizes of farms, generally, are the net farm incomes as high as those of semi-skilled workers in nonfarm employment.

An increasing share of the costs of farm operation in recent years has been cash costs. This is especially true on the larger farms, and in the relatively higher farm income regions. The margin between cash cost of farm inputs and value of products sold is relatively narrower on larger farms than on small farms. But a large volume of business can result in a substantial net return even if the profit margin is narrow, as long as it is positive. These observations are brought out by parts of the analysis now completed. Observation of input-output ratios over the entire range of farm sizes studied will be possible when the analysis now underway is completed.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

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B. Economics of Farm Size and Numbers of Farms

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AREA NO. 4. FARM CAPITAL, CREDIT, AND FINANCIAL CONDITION

Problem. Farm capital and credit requirements, and the financial condition of farmers, are changing continuously. The changes result from the explosive effects of new technologies in agriculture, from the increasing integration of agriculture and other industries including contracts for production, and from changes in farm prices, income, land values, and types and sizes of farms. Continuous study is needed to keep abreast of the changing capital requirements for various tenures, types and classes of farms, and to determine how farmers accumulate the capital needed for their operations and whether credit institutions are providing adequately for farmers' changing credit needs. Better tools need to be developed for measuring the effects of the changes in agriculture and in farm capital and credit requirements on farmers' assets, debts, and equities. Studies are needed for the guidance of farmers and credit institutions and to aid policymakers and program administrators in appraising the effects of the farm program.

USDA PROGRAM

The work in this area comprises a long term program of statistical and economic research in three principal areas: The balance sheet of agriculture and financial outlook; improvement of farm mortgage credit facilities; and short term credit and financial management.

In Washington, D. C., the work on the balance sheet of agriculture and financial outlook involves chiefly the assembly and analysis of data on farm assets, debts, and incomes and on factors affecting the financial situation of farmers. The Division has become a clearing house for data on farm debts, to which the major lenders (or their supervisory authorities) report on their own loans to farmers and look for comprehensive information on the entire farm debt situation. In addition the Division assembles data collected elsewhere in the Department and by some other agencies on farm assets and incomes and issues each year two analytical reports: (1) "The Balance Sheet of Agriculture" which measures and explains changes during the last year in the financial situation of agriculture; and (2) the "Agricultural Finance Outlook" which projects current trends and estimates what the farm financial situation will be during the next year. These publications contain the only available comprehensive analyses of the farm financial situation.

As an aid in preparing the Agricultural Finance Outlook, surveys are made each fall in 25 counties of 23 States to determine the views of local farmers, credit institutions, merchants, and dealers concerning the current farm financial situation and prospects for the coming year.

In the work on improvement of farm-mortgage credit facilities in Washington, D. C. data from all available sources are assembled and consolidated to determine the amount and distribution of the farm-mortgage debt, the terms on which farm-mortgage credit is available from the principal lenders, the current volume of loans and repayments, and the extent of farm-mortgage debt delinquencies and foreclosures. Quarterly reports on the mortgage lending activities of the major life insurance companies and federally-sponsored agencies are obtained and analyzed. At 5-year

intervals, immediately following the Census of Agriculture, cooperative surveys with the Census are made to determine the amount of farm mortgage debt held by nonreporting lenders, and the distribution of all mortgage debt among the various types, sizes, and economic classes of farms. The data from this activity are used in computing parity prices for agricultural products and in preparing the Balance Sheet of Agriculture, the Farm Cost Situation, and the Farm Income Situation; they also are used regularly by the National Agricultural Credit Committee, which meets three times each year to appraise the farm-mortgage situation. Numerous requests for data on the farm-mortgage situation are received each year from legislators, farm organizations, farm journals, the State agricultural experiment stations, and others.

In Lafayette, Indiana, in cooperation with the Purdue University Agricultural Experiment Station, factors affecting the demand for, and supply of, farm-mortgage funds are being studied and related to the adjustment problems of agriculture.

In Columbia, Missouri, and Bozeman, Montana, arrangements have been made with with the agricultural experiment stations of these States for studies to determine the factors affecting the availability, cost, and other terms of credit for rural housing.

In the research on short-term credit and financial management, statistical work in Washington, D. C. is similar to that done on farm-mortgage credit, that is, serving as an assembly point and clearing house for information on the non-real-estate credit used in agriculture. The data from this part of the work have uses similar to those for the data on mortgage credit, except that they are not used in computing parity prices of agricultural products. These data are in wide demand. A major project currently underway is a survey, cooperative with the Census Bureau, of all farm debt of operators and landlords, by type and economic class of farm.

Cooperative work with the agricultural experiment stations of the respective States includes the following: At Madison, Wisconsin, a study of the management services rendered by lending institutions in extending credit to farmers; at East Lansing, Michigan, studies of methods by which Michigan farmers accumulate the capital used in their operations and of the financing problems of large-scale farms; and, at Urbana, Illinois, a study of the financing of mechanized cattle feeding operations.

Federal professional man-years devoted to this work total 10.2 divided as follows: balance sheet of agriculture and financial outlook, 2.5 man-years; improvement of farm mortgage credit facilities, 2.5 man-years; short-term credit and financial management, 4.8 man-years; program leadership, 0.4 man-years.

These cooperative studies were terminated during the period: (1) A cooperative study with the University of Illinois of alternative methods of obtaining financial information from farmers; (2) a cooperative study with the Mississippi Agricultural Experiment Station of contract egg production in Mississippi; (3) a cooperative study with the Michigan Agricultural Experiment Station of capital and credit requirements for efficient farming in Michigan; and (4) cooperative studies with the agricultural experiment stations of Indiana, Ohio, and Pennsylvania of farmers' knowledge of credit sources and their use and management of credit.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

The State agricultural experiment stations are devoting annually about 7.6 professional man-years to work in this field. Major problems to which their research is directed are the processes of capital accumulation in agriculture, the adequacy of farm credit facilities, the policies of credit institutions, the financing of farm adjustments, and the relationship between farmers' attitudes toward use of credit and the existence of small, inadequately capitalized farms. Some work on these and related problems is being conducted in at least half the States.

It is estimated that about 12.0 man-years of professional work in this field are done by personnel and members of the American Bankers Association, the Federal Reserve System, and the cooperative Farm Credit system. The research work of these agencies is concerned chiefly with improving the services of the various credit institutions to agriculture.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. The Balance Sheet of Agriculture and Financial Outlook

The financial situation of farmers was eased in 1961 by an increase of more than $1 billion, or almost 10 percent, in their net realized income from farming. The gain in farm income resulted from strengthened markets for farm products and from payments under the feed-grain program. With the higher income, farmers were able to increase their payments on mortgaged debts and to arrest the decline in their holdings of currency and bank deposits that had occurred in 1959 and 1961. Higher farm income also gave an added boost to the farm real estate market, resulting in a rise of about 5 percent in farm real estate prices and an increase of about $6 billion in the total value of farm real estate. Chiefly because of this increase, the value of all farm assets rose from about $200 billion at the beginning of 1961 to more than $207 billion at the end of the year. Farm debts rose by $2.2 billion but the equities of farmers and other owners of farm property increased by more than $5 billion during the year.

B. Improvement of Farm-Mortgage Credit Facilities

Farm mortgage debt outstanding on January 1, 1962 amounted to $14.2 - up $1,107 million or 8.5 percent from a year earlier. The increase in 1961 was the third largest on record. Twice before in the post-World War II period the rise exceeded $1 billion.

The dollar amount of farm mortgages recorded in 1961 was 17 percent above the 1960 level. The volume of mortgage lending remained high during the first half of 1962.

In 1961, repayments of farm mortgage loans also increased. For the Federal land banks, repayments in 1961 equalled 8.4 percent of outstanding loans compared with 8.1 percent in 1960; for life insurance companies they were 10.8 percent compared with 10.0 percent in 1960. Delinquencies and foreclosures of farm mortgage loans remained low in 1961.

Interest rates on farm mortgage loans made in 1961 were unusually stable. They ranged from 5.5 to 6.0 percent on the bulk of the loans made by private and cooperative lenders.

In a cooperative study at the Purdue University Agricultural Experiment Station, annual farm mortgage recordings are being correlated with changes in various farm and money market series in an attempt to get a better understanding of the factors that influence the flow of long-term credit into agriculture. So far, the results of this work have been disappointing. Apparently the series of data used in this analysis have not adequately reflected the farm demand for, or the market supply of, mortgage funds.

Data from the 1961 survey of farm mortgage debt (cooperative with Census) have been tabulated, and revised estimates of farm mortgage debt by States have been prepared. A report on the results of this survey has been written and is being prepared for publication.

Considerable work has been done during the year on a study of the financing of rural housing. Data have been obtained from the Federal Reserve Board which show bank holdings of residential mortgages by State and county and by size of bank, and data provided by the Housing and Home Finance Agency on operation of the Voluntary Home Mortgage Credit Program have been tabulated. These data will reveal many of the differences that exist with respect to the availability of credit for housing purposes in rural and urban areas. Also arrangements have been made with the agricultural experiment stations of Missouri and Montana for cooperative studies of the source, costs, and other terms of credit for rural housing in selected areas of these States.

C. Short-Term Credit and Financial Management

Farm debt not secured by real estate (excluding CCC loans) increased by $673 million or 6 percent during 1961. The increase was slightly larger than during the previous year but only about half as large as the rapid expansion in 1958 and 1959. In the first quarter of 1962, loans continued to expand at about the same moderate rate as in the spring of 1961.

CCC loans increased about $500 million during 1961, because of an increase in farmer-owned stocks of soybeans and the change from purchases to loans in the price-support program for cotton.

Interest rates charged by PCA's declined steadily during 1961, but the rates charged by banks on non-real-estate loans to farmers, according to the sparse data available, did not change much.

In Michigan, data obtained from 140 participants in the Michigan Farm Accounts Project on the processes by which they attained their 1961 financial situations have been tabulated and are being analyzed. Arrangements have been made for an additional study, also in cooperation with the Michigan Agricultural Experiment Station, that will concentrate on the financing problems of large-scale farming enterprises.

A manuscript on "Credit Use and Financial Progress on Michigan Farms" has been prepared and is nearly ready for publication. This study shows that banks and PCA's supplied about three-fourths of the credit used by Michigan farmers for operating purposes, machinery, and livestock. Land purchases and other fixed investments were financed chiefly by the Federal land banks, individuals, and insurance companies. For the most part farmers were able to repay their loans in accordance with the repayment schedules established

for their loans. In general, the financial progress made by farmers during 1954-58 depended on the extent to which they increased their scale of operations, and this, for many of them, depended on the extent to which they used credit for capital purposes. However, some farmers were able to improve their financial situations substantially without using much credit; others used substantial amounts of capital credit but failed to make much progress.

In Wisconsin, a report was published on a study of the importance of agricultural loans to banks and of the management services rendered by banks in extending credit to farmers. The study indicated that agricultural management counseling plays only a minor role in Wisconsin banking. However, there are indications that it may increase in the future among banks that expect to expand their agricultural lending business. Cooperative studies of the management services rendered by production credit associations and the Farmers Home Administration are underway. A report on the study of production credit associations is now being prepared; data for the study of the Farmers Home Administration have been collected and are now being coded and punched on cards.

Tabulations of farm debt data from the 1960 Census sample survey of agriculture are nearly completed. These data show relationships between farm debts and type, size, and economic class of farm that have never before been available. They also separate debts of operators from debts of landlords. Plans call for about 20 reports to be prepared from these data by personnel of the Federal Reserve Board and Federal Reserve Banks, the Farm Credit Administration, and this Division. Most of the assignments of subject matter among these personnel have been made.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. The Balance Sheet of Agriculture and Finance Outlook

Bierman, R. W., Hill, H. L., Ellickson, J. C., Garlock, F. L., Hamlin, E. T., and Jones, L. A. 1961. Farming in the Great Plains-A survey of the financial and tenure situation in 1957. USDA Prod. Res. Rpt. No. 50.

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1961 Agricultural Finance Outlook. November 1960. ARS 43-136.

Garlock, F. L., Hansing, F. D., Scofield, W. H., Stocker, F. D., and Dallavalle, Q. F. 1961. The Balance Sheet of Agriculture, 1961. Agr. Inf. Bul. 247. (Condensed version in August issue of the Federal Reserve Bulletin)

1962 Agricultural Finance Outlook. November 1961. ERS, AFO-1.

Garlock, F. L., Allen, P. T., Dallavalle, Q. F., Jones, L. A., Scofield, W. H., and Stocker, F. D. 1962. The Balance Sheet of Agriculture, 1962. Agr. Inform. Bul. 270. (Condensed version in August issue of Federal Reserve Bulletin)

B. Improvement of Farm-Mortgage Credit Facilities

Eitel, V. E. 1962. Farm mortgages recorded in 1959, interest rates, terms and sizes with historical data, 1949-59. ERS-61.

Hesser, L. F. and Jannsen, M. R. 1960. Capital rationing among farmers. Purdue Agr. Expt. Sta. Res. Bul. 703.

Hesser, L. F. 1961. Theoretical consideration concerning supply of and demand for long-term credit in agriculture. Purdue University Production Economics Paper 6102.

Hesser, L. F., and Jannsen, M. R. 1961. Use of credit by farmers in central Indiana. Purdue Agr. Expt. Sta. Bul. 718.

Farm Real Estate Debt. August 1961. ERS, RED-1.

Farm-Mortgage Lending Experience of Life Insurance Companies, the Federal Land Banks, and the Farmers Home Administration.

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March 1961	ARS 43-141
July 1961	ERS FML-1
December 1961	ERS FML-2
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C. Short-Term Credit and Financial Management

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Wirth, M. E., and Nielson, J. 1961. Resource ownership and productivity in Michigan farms. Mich. Agr. Expt. Sta. Spec. Bul. 435.

Hansing, F. D. 1962. Contract egg production and use of credit by selected producers in Mississippi. Mississippi Agr. Expt. Sta. Bul. 644.

Loomis, R. A. and Wirth, M. E. 1962. Financial progress on Michigan farms-a contrast between part-time and full-time farming. Mich. Agr. Expt. Sta. Quart. Bul. Vol. 44, No. 4, pp. 624-643.

Wirth, M. E. and Loomis, Ralph A. 1962. Part-time farming in Michigan. Michigan Farm Economics No. 232.

Christiansen, R. A., Hartwig, P. A., and Staniforth, S. D. 1962. Bank credit for agriculture in Wisconsin. Wisconsin Agr. Expt. Sta. Bul. 557.

Bostwick, D., Esmay, J., and Rodewald, G. 1961. Agricultural production credit in Montana. Montana Agr. Expt. Sta. Cir. 233.

Bostwick, D., Esmay, J., and Rodewald, G. 1961. Attitudinal research relating to farmers' use of short-term credit. ERS-25.

AREA NO. 5. AGRICULTURAL RISKS AND INSURANCE

Problem. Risk bearing is a necessary and costly function of ownership and management in farming because of production hazards and price uncertainties. Expanded research in reducing agricultural risks should prove valuable to farmers in making management decisions, and to Government agencies and private insurance and financial institutions in adjusting their policies to meet farmers' needs.

Research in this field includes possible modifications of existing insurance, credit and taxation policies, which impose excessive burdens when farm incomes are low. It also includes study of alternative means by which farmers can (1) reduce risks by the adoption of new financial and production practices, (2) shift part of the risk to insurance, financial and Government institutions, or (3) most effectively combine these two approaches.

With rising farm-property valuations, more use of credit, inflation, and greater chance of personal injury, fatalities, and lawsuits (due to accidents arising from increased mechanization and more highway travel), more kinds and larger amounts of property, health and sickness, life, and liability insurance are required by today's farmers. There is considerable variation in premium costs among companies for identical coverages. The increased insurance coverages carried by farm operators require high premium outlays. Figures of from $1,000 to $1,500 are not uncommon. Priorities need to be established to aid farmers in allocating a given premium outlay according to need.

USDA PROGRAM

A continuing program of applied economic and statistical research is carried on that involves the compilation of operating data for the farmers' mutual fire, windstorm and crop-hail insurance companies, and the analysis of problems and trends in such insurance (loss rates, expenses, proper safety-fund levels, reinsurance needs, etc.); evaluation of effects of OASDI on insurance programming and the retirement plans of farm operators, and on the tenure, number, size, organization, and management of farms; the development of farm-income distributions from OASDI data; and measurement of the causes and incidence of farm fire losses and farm accidents.

The work includes study of (1) the incidence of production risks, as reflected by yield variability and other factors, on the structure and functioning of farm units, and (2) various methods of risk bearing and financial measures that might provide guides for management decisions on feed and cash reserves, geographical dispersion of farming operations, flexibility of organization, depreciation and tax management, better planning, and insurance, from the standpoint of helping farmers improve the stability of their farm income and their prospects of survival during periods of drought, as well as their long-run capital accumulation, and also to provide guides for the action programs of government, private insurance agencies, and financial institutions.

The work is done in Washington, D. C., with the informal cooperation of the Federal Crop Insurance Corporation, Bureau of Old Age, Survivors, and Disability Insurance, insurance trade associations, farmers' mutual insurance

companies, State insurance commissioners, State fire marshals, and in Montana, with the formal cooperation of the Montana Agricultural Experiment Station.

The program involves a total of 5 Federal professional man-years distributed as follows: Program leadership, 0.2 man-years; improvement of farmers' mutual fire, windstorm, and crop-hail insurance company operations, 0.8 man-years; organized farm fire protection and estimation of annual farm fire losses, 0.4 man-years; casualty and life insurance (including social security) and accident prevention for farmers, 1.3 man-years; and analysis of risks and risk-bearing in agricultural production, 2.3 man-years.

The research subareas or lines of work listed above are broad in scope. Certain segments of the work were completed and results published during the period under review; work on other segments was initiated.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

State experiment stations are currently devoting a total of only about 0.9 professional man-year to all the subareas of research listed above. This includes, for the North Central Region, a study of the factors that are related to the amount of farm property insurance carried by farmers; for the Western Region, a study of the magnitude of the fire losses and valuations protected by a State fire-control system on specified wild-land areas; and, for the Northeastern Region, projects covering (1) a dynamic analysis of risk factors in a specified area of agricultural production, and (2) an appraisal of the risk-reducing alternatives available to dairy farmers.

Part of the cost of the project for the North Central Region is borne by the National Association of Mutual Insurance Companies. The National Association also occasionally collects some information from the farm mutual insurance companies; but its staff does very little, if any, analytical work. The Association is concerned primarily with legislation and sales promotion. The National Fire Protection Association and the National Board of Fire Underwriters assemble some information on the causes of farm fires; however, most of their findings pertain to urban rather than rural fires. The USDA's estimate of farm fire losses is the only one made and is used by both of these organizations. The Farm Division, National Safety Council, assembles some information on farm accidents from secondary data.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Improvement of Farmers' Mutual Fire, Windstorm, and Crop-Hail Insurance-Company Operations

A study of the fire and lightning claims paid by 45 farm mutual fire insurance companies during 1958 and 1959, by size of loss, indicated that a $50 deductible clause would have reduced rates by 11 percent. A $100 deductible would have reduced rates by 16 percent. These reductions include only savings from claim payments; they do not include savings in operating expenses because of not having to adjust the many small claims that would have been eliminated by the deductibles. The results of the study were published in an article "What About a Fire Deductible?" in the Mutual Insurance Bulletin for November 1960. It was also found that about two-thirds of the total number of claims paid amounted to $50 or less, and that about three-fourths

amounted to $100 or less. Many of these small claims are for lightning damage to electrical appliances, and, as was pointed out, the chances of loss from this cause can be greatly reduced by the installation of lightning rods on buildings and arrestors at the service entry (meter box).

An analysis was made of the operating experience of 238 sample farm mutual insurance companies during 1960 and 1961. Published as a separate and republished in the Mutual Insurance Bulletin, the report indicated that fire losses declined slightly in 1961 compared with 1960 (from 14.9 to 14.6 cents per $100 of insurance); that operating expenses were slightly higher (7.4 compared with 7.3 cents); and that assessment rates were increased slightly (from 27.6 to 27.9 cents per $100). Windstorm losses were considerably higher in 1961 than in 1960 (8.6 cents compared with 5.3 cents per $100).

B. Organized Farm Fire Protection and Estimation of Annual Farm Fire Losses

At the request of the Lightning Protection Institute and the Thor Research Center, a study is being made of the extent of lightning damage to farm property. U. S. farm fire and lightning losses were estimated by the Division at $163 million for 1961; but thus far no attempt has been made to break down the annual estimates between (1) losses from fire not caused by lightning, and (2) losses from lightning, whether or not fire ensued.

C. Casualty and Life Insurance (Including Social Security) and Accident Prevention for Farmers

A farmers' handbook of financial calculations and physical measurements was prepared in which problem solutions are given for the calculation of interest rates on small loans and installment sales, amortization, sinking funds, social security survivorship and retirement benefits, and life insurance estate planning. Since financial calculations are often based on physical measurements, the report also covers such matters as estimating acreages, yields in the field, and bushel in the bin. The demand for the publication has exceeded expectations.

Preliminary results of a study of the distribution of farm incomes for 1957, by regions, based on social security data reported on schedule F, were published in the Agricultural Finance Review for April 1962. The study indicated that the under-reporting of farm self-employment incomes because of covered wages, did not seriously affect the distribution of these individual incomes. The earned farm self-employment incomes reported for social security purposes do not include noncash perquisites or capital gains, and so differ conceptually from the better known farm-income series; nevertheless, it appears that comparisons between regions for a given year, and for a given region over time, may be made. About a third of the farm operators reported by the 1959 Census did not file tax returns for social security coverage, in most instances because their net self-employment incomes from farming were less than $400.

A study of farm accidents, based on vital statistics data 1949-59, the National Health Surveys (made since 1957), and "spot" studies made in a number of States, indicates that the annual mortality from farm accidents ranges from about 60 to 70 per 100,000 farm people. Nonfatal injuries involving both lost-time and no-lost-time accidents, occur to about a fourth

of the farm population annually. The lost-time injuries involved 19 percent of the farm population, while the nonserious nonfatal accidents affect about 3 percent of the farm population annually. Motor vehicles are the agency of injury most frequently associated with accidents to farm people; farm machinery was the agency most frequently associated with accidents occurring on farmland; and falls were most frequently associated with home accidents. The results of this study are to appear in a report "Farm Accidents in the United States," now in process of publication.

D. Analysis of Risks and Risk-Bearing in Agricultural Production

In an article "Federal Crop Insurance Tied to a Bushel-Quota Farm Program," appearing in the Journal of Farm Economics for August 1962, a substitute plan of crop insurance was presented. Especially adapted to farming in the Great Plains, the plan could be operated only if bushel quotas were substituted for acreage allotments. Under the plan, a farmer would be guaranteed that his returns would be at least equal to his quota bushels multiplied by the support price. Bushels in excess of quota for the preceding year (option A) or for the two preceding years (option B) would be used by the Federal Crop Insurance Corporation to offset deficit bushels in the year of insurance.

A long-term (4 or 6-year) contract and a "variable" premium would be part of the package. Under the variable-premium arrangement, the farmer would pay a premium equal to a predetermined (area-wide) percentage of his own annual yield. Thus, he would pay most of his premiums in the high-yield years when they would be least burdensome, and in the low or no-yield years he would pay little or nothing. Based on records for tracts leased continuously by the State of Montana to individual operators under share leases, a coverage-quota equal to two-thirds of the tract-average yield would require a premium rate equal to only about 2 percent for option A, and 1 percent for option B, of the long-term average yield for the individual tract.

A long-standing problem for the Federal Crop Insurance Corporation (FCIC) in setting rates and coverages for crop insurance on new crops and/or new counties has been how to use county-yield data, often for as long as 30 years, to measure the full risk under individual contracts. This is also a major problem for foreign countries in considering crop insurance.

The Montana data cited above are being used to investigate methods by which the transition from county data to individual contracts might be made. In a related study, also to be briefly summarized in the same report, assistance is being given to the Mexican crop insurance people in deriving a generalized curve of relationship between county annual yields, as percentages of average, and FCIC indemnities paid under individual contracts, as percentages of the coverage. While the problem is the same in both studies, one uses as source material the State-lease data in Montana, and the other uses FCIC experience under individual contracts, by counties and by years.

In a study of crop insurance in Montana, published as an experiment station circular, it was found that sample dryland wheat farmers preferred to use stored grain rather than all-risk crop insurance as a hedge against low yields, and that the 1959 crop-insurance coverage did not meet cash needs in the Northeast Area. For this area, a level of protection which includes an allowance for minimum family living expenses would require an increase in coverage from 7.9 to 9.5 bushels. Then, if barley insurance also were made

available in this area, it, together with the wheat insurance would assure cash liquidity in the low-yield years. In a study (completed but not yet published) of the capital requirements for dryland wheat farming in Montana, an investigation was made of ways sample farmers got started, their increases in acreage by method of acquisition and by periods, how they are protecting their investments and to what extent insurance enters the picture, their attitudes toward dryland farming and the extent to which these attitudes have contributed to success in farming, and the institutional restraints on getting started and on expanding existing units.

A methodological study is being made of the distribution of annual net farm incomes over time for individual farms, based on records furnished by the Farmers Home Administration (FHA) and a farm business association, with a view to assigning probabilities to various income levels expressed as percentages of average. For example, records for 12 farms in a Kansas county covering 7 years each (1955-61) indicate that there is about a 26 percent chance that annual net farm income will fall within a range of plus or minus 20 percentage points from the mean net income, i.e., between 80 and 120 percent of the 7- year average for an individual farm.

The study should be helpful to Extension people and to the FHA in illustrating an area of research in which available data are not being applied. The research also should be useful in our work on risks and in arriving at income distributions based on social security data.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Improvement of Farmers' Mutual Fire, Windstorm, and Crop-Hail Insurance Company Operations

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Botts, R. R. 1961. What's wrong with the local mutual? Proceedings, Eastern Regional Midyear Meeting, National Association of Mutual Insurance Companies, pp. 46-58.

Botts, R. R. 1962. Advances of farm mutual insurance. Mutual Insurance Bulletin, 49(1), pp. 4-8.

B. Organized Farm Fire Protection and Estimation of Annual Farm Fire Losses

Botts, R. R. 1961. Rural fires. Proceedings, 14th National Institute for Farm Safety.

Botts, R. R. 1961. Farm fire-loss statistics. Proceedings, National Farm Fire Safety Seminar.

C. Casualty and Life (including Social Security) and Accident Prevention for Farmers

Ellickson, J. C. 1962. Distribution of farm incomes. Agricultural Finance Review, Vol. 23, pp. 27-31.

Botts, R. R. 1962. Farmers' handbook of financial calculations and physical measurements. USDA Agr. Handbook No. 230.

D. Analysis of Risks and Risk-Bearing in Agricultural Production

Rodewald, G., Jr. 1961. Crop insurance in Montana. Mont. Agr. Expt. Sta. Cir. 235.

Botts, R. R. 1962. Federal crop insurance tied to a bushel-quota farm program. Jour. Farm Econ. 44(3), pp. 769-780

AREA NO. 6. FARM TAXATION AND RURAL GOVERNMENT

Problem. Steadily growing requirements for schools, roads, and other governmental services are placing a severe strain on existing sources of State and local tax revenue. One result has been a more than doubling in farm real estate taxes since the close of World War II, with no evidence that the steep rise will slow in the foreseeable future. Research is needed on problems of financing governmental services in rural and suburban-fringe areas, including consideration of the effects of taxation on agriculture, the role of the property tax in local finance, and possible alternative sources of revenue. The purpose of this research is to find ways to ease financial problems of rural governments and the tax burden on agriculture.

Problems of local finance stem partly from inappropriate forms of local governmental organization. In most States, the structure of local government in rural areas was established generations ago and has not been adapted to today's needs. Considerable experimentation is going on with new forms of governmental organization and new financial arrangements. Research is needed to analyze and evaluate this experience and make the findings available to other communities facing similar problems.

USDA PROGRAM

This work includes maintenance and improvement of statistical series on the major taxes paid by farmers, and analysis of the effects of various taxes on agriculture. Attention is given to tax proposals, Federal, State or local, that appear to have important consequences for farmers or agriculture. Studies cover problems in assessment and taxation of farmland, especially in rural-urban fringe areas; the sources of revenue for rural governments; and local government structure and organization in sparsely settled areas and in rural areas around growing cities. This work involves the disciplines of economics, public finance, political science and public administration.

Work was carried on in Washington, D. C. and in cooperation with the experiment stations of New York, Maryland, Michigan, Illinois, Iowa, Florida, Missouri, Louisiana, Nebraska and California. A three year research contract was entered into in 1961 with the Bureau of Governmental Research of Indiana University.

In fiscal year 1962, a total of approximately 8.0 Federal professional man-years was devoted to this program, distributed as follows: Program leadership, 0.2 man-years; estimates of the amount and incidence of farm taxes, 1.3 man-years; assessment and methods of assessing farm property, 2.0 man-years; organization and finance of local government, 4.5 man-years. Currently, a total of about 9.5 man-years is devoted to the program.

During the past year, research on assessment and methods of assessment of farm property has been discontinued at East Lansing, Michigan; work on a similar topic was initiated at Urbana, Illinois.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

Fourteen experiment station projects are active in this general area. Seven are concerned with estimating the amount and incidence of taxes paid by agriculture; four with studying farm assessments and methods of assessment; and three with organization and finance of local government. In total, they account for about 3.1 professional man-years.

Most State tax commissions do a small amount of research in taxation, but little of it bears on farm tax problems. University bureaus of governmental research occasionally undertake studies of local government functions, organization and financing, but these typically have only incidental value in solving problems facing smaller and more rural units. All this work probably aggregates no more than 4 professional man-years.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Estimates of the Amount and Incidence of Farm Taxes

A special survey conducted last year by the Bureau of the Census and the Economic Research Service of the USDA provided a new 1960 benchmark for the annual estimates of taxes levied on farm real estate. Revised estimates of taxes per acre were prepared for the years 1950-1960. The revision resulted in a slight increase in the estimated tax per acre for each year since 1955.

At the same time, estimates of taxes levied on farm real estate were prepared for the first time for Alaska and Hawaii.

Taxes levied on farm real estate in 1961 totaled $1,329.5 million, an increase of $78.6 million or 6.3 percent above the amount levied in 1960. These levies, most of which are imposed by local units of government, averaged $1.30 an acre compared with $1.22 in 1960. They are payable for the most part in late 1961 or early 1962.

Taxes on farm real estate in 1961 absorbed 8.7 percent of total net farm income, the same as in 1959. In 1960, the proportion was 8.8 percent. The decline in 1961 is attributable to a substantial increase in net income between 1960 and 1961. The ratio of farm real estate taxes to net farm income was highest in North Dakota at 20 percent and lowest in Alabama and North Carolina at 2 percent. The ratio of farm real estate taxes to net farm income was less than 5 percent in 12 States, mostly in the South; between 5 and 10 percent in 15 States; and above 10 percent in the remaining 21 States.

Taxes levied on farm personal property in 1961 are estimated at $285 million or about a fifth as much as was levied on farm real estate. Continuing mechanization of agriculture and increasing numbers and value of livestock are contributing to the rising level of farm personal property taxes.

In contrast to agricultural real estate, which is taxed in all 50 States, the tax treatment accorded to personal property varies widely from State to State, and often from one locality to another. This was the conclusion of a study of taxation of tangible personal property used in agriculture, completed in 1962. The tax differences range from complete exemption in four States to complete inclusion on the tax roll in seven States. Between these extremes are States which exempt some, but not all, tangible farm personal

property from taxation. There is considerable variation among the States as to exactly what is exempted and how the exemption is granted. In addition, administrative differences affect the amount of taxes levied.

A recent study of State-local taxes in the Great Plains showed that the property tax provides a comparatively large share of State-local revenue in the Northern Plains (Montana, North Dakota, South Dakota, Nebraska, Wyoming, Colorado, and Kansas). The Southern Plains States (Texas, Oklahoma and New Mexico) rely much less heavily on the property tax. Agriculture constitutes a large and somewhat unstable component of the economy of these 10 States.

Although the Plains States are characterized by comparatively low incomes, they show a relatively great tax effort. State and local government expenditure per capita is substantially more than the U. S. average. For example, North Dakota with a per capita income 22 percent below the U. S. average in 1960 was second highest in the Nation in taxes per $1,000 of personal income. The property tax is the dominating source of revenue in most of the Plains States. Nonproperty taxes, such as sales and personal income taxes, are used less intensively. Federal grants-in-aid form a large component of State and local revenue; in 1960 this source supplied 18 percent of all revenue.

An analysis of taxes levied on farm real estate located in Standard Metropolitan Statistical Areas indicated that in 1960, taxes per acre averaged more than double the taxes on farms located in counties immediately adjacent and about 5 times as high as in rural counties--those that are some distance from metropolitan centers. It is estimated that in 1960 about 20 percent of the total farm real estate levies originated in metropolitan areas.

The relatively high level of taxes per acre in metropolitan areas results largely from three important causes. One is the pressure of urban and suburban expansion, which bids the value of land upward and often leads to increased assessments for tax purposes. The second is the fact that, as suburban development occurs, the increasing cost of supplying local government services places added demands on the general property tax in these areas. In 1957, the latest year for which data are available, a little more than half of all general revenue in metropolitan areas originated from the taxation of property. A third factor lies in the fact that farmland in metropolitan areas is usually of better than average quality and is easily adapted to intensive types of farming, such as fruit, truck, dairy, and specialty agricultural products. Dairy farms, for example, predominate in metropolitan areas in the Northeast, while fruit and truck farming are important in metropolitan areas of California.

A study of the effect of selected taxes on FHA borrowers in Nebraska, carried out in cooperation with the Nebraska Agricultural Experiment Station, found that replacement of a portion of the property tax by a sales or income tax, or a combination of the two, would result in a reduction in fixed costs and an accompanying increase in the correlation between tax liabilities and income. Farmers could thus cope more successfully with periods of adverse economic conditions.

B. Assessment and Methods of Assessing Farm Property

A comparative study of assessment of farm property in the North Central States found that, despite considerable improvement over the years, marked inequalities in farmland assessment still exist. Steps toward improved assessment include enlarging the unit for assessment, establishing professional standards for assessment personnel, and providing the assessor with more adequate tools with which to carry out his function.

Much attention has been given to the problem of assessing farm real estate located in the rural-urban fringe. The demand for industrial sites, residential subdivisions, and shopping centers often pushes the price of agricultural land to values far greater than can be supported in farm use.

When translated into assessed valuations, these higher values intensify economic pressures on agriculture, often far beyond the urbanized area itself. They give added incentive to farmers to sell their land and reap their capital gains. The results--speculative buying and selling of farmland and abandonment of farming operations-- have become causes for concern to those interested in preserving the economic position of agriculture, as well as to those interested in the orderly development of metropolitan areas.

To ease the impact of rising real estate taxes on agricultural lands in the rural-urban fringe, several States have enacted laws that require assessment of agricultural real estate solely on the basis of its value in agriculture, without regard to other possible uses. Many others have considered legislation of this general kind.

A study in Maryland indicated that a policy of assessing farmland on the basis of agricultural value alone affords substantial tax benefit to individual owners. In the counties studied, reductions in the tax base as a result of this law ranged from 1 to 7 percent. Serious administrative difficulties were encountered, particularly in defining "agricultural use" in such a way as to confine the application of the law to bona fide farms.

Analysis of data on farm real estate taxes in the St. Louis, Missouri, area indicated that taxes in 1960 were more than three times the Statewide average. Preliminary findings suggest also that, in selected study areas, rural land held by farmers may be assessed at higher levels than that held by nonfarmers.

An unusually heavy amount of service and consulting work has been required in connection with research on this topic, as many States have been considering special tax legislation for farmland in rural-urban fringes.

C. Organization and Finance of Local Government

A study of rural government structure and its relation to service levels and revenues concluded that problems of local governmental finance stem partly from inappropriate forms of local governmental organization. In most States, the structure of local government was established generations ago. Many of our rural school districts, townships, and counties are no longer effective administrative units for the functions they are now called upon to perform.

The same study considered several ways in which the property taxload can be eased. Responsibility for certain local functions could be shifted to some other level of government. A second alternative would be for local units to rely more heavily on State funds. Finally, local governments can attempt to develop new sources of revenue.

Research on the relation of population density to per capita tax burdens showed that sparsely populated areas typically have a heavy taxload per capita. They tend also to have a level and variety of public services that is somewhat lower than is available in more populous areas. Consolidation of governments or functions would probably alleviate the problem, though not solve it. State aid systems might also be re-examined.

A study of farmers and urban expansion, carried out in cooperation with the Institute for Community Development, Michigan State University, found that among the short-range problems caused by urbanization, the most concern was over increased taxes, sewage or drainage difficulties, crowded schools, and unsightly buildings.

Although the full-time commercial farmers controlled the township government, they were found to be least likely to anticipate urbanization in the near future. As a result, the one group in position to guide effectively the urbanization of the township felt no immediate need for action. It was concluded that unless this attitude can be changed, uncontrolled development will increase the problems with which farmers must cope as urban areas surround farmland.

An analysis of the effects of various forms of metropolitan government reorganization on the residents of surrounding rural areas found that as urbanization continues to spread out into the rural portions of our metropolitan areas, bringing such problems as urban sprawl, traffic congestion, slums, automobile "graveyards," and ribbon development along the highways, both the traditional rural systems of government and many of our present urban governments will be found to be inadequate to cope with these problems. If local governments are to meet these metropolitan problems, they must be modified. Five alternative forms of metropolitan government were described and compared. It was concluded that in the long run, rural residents will benefit most if they take an active part in bringing about the necessary adjustments in local government in metropolitan areas.

A study of problems of local government in sparsely populated areas reviewed past proposals for updating rural local government and the reasons for their notable lack of acceptance. It was concluded that efforts at local government reform should observe three principles: The local government unit should have the general power to do all local government tasks that are to be done within its boundaries; it should be flexible so that its organization and activities can be expanded or contracted by the local citizens as conditions change; and it should be politically responsible.

Research on the evolution of local government in rural areas, concentrating on the experience of Iowa, has identified major respects in which institutions have adapted to changing conditions, and others in which little adaptation has occurred. The findings suggest that local government in rural areas tends to be costly and inefficient. Proposals were advanced for reducing governmental costs and improving governmental functioning.

A three-year contract study of interlocal cooperation in administration and financing of governmental functions was initiated in June 1961. The work is being done by the Bureau of Governmental Research of Indiana University, and covers five selected States: Indiana, Wisconsin, Pennsylvania, Alabama, and Nebraska. Progress thus far includes preparation of a comprehensive bibliography; a study of statutory authority for interlocal cooperation; and a mail survey of the extent and variety of interlocal cooperation. Results to date suggest that this phenomenon is more prevalent than is generally realized.

The current phase consists of intensive examination of selected examples of cooperative arrangements. No publications have yet appeared, but the September 1962 meeting of the American Political Science Association included a panel on the topic, in which most of the project participants summarized their tentative findings.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Estimates of the Amount and Incidence of Farm Taxes

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Stocker, F. D. 1962. Tax problems in the rural-urban fringe. Iowa State University, Farm Policy Forum. June.

AREA NO. 7. FARMLAND VALUES AND VALUATION

Problem. Farm real estate represents two-thirds of all assets in agriculture. It had a total market value of $138 billion on March 1, 1962. This represents an average value of farmland and buildings of about $41,000 per farm, the highest of record. Market prices have increased almost steadily since the beginning of World War II, advancing 273 percent between 1940 and 1962. Nearly a third of this increase has occurred since 1950, despite the fact that farm income did not change greatly. As a result, the present relationship between land prices and net farm earnings is the most unfavorable since the late 1930's. Net returns on current market values dropped to a low of 3 percent in 1959, and remain below 5 percent currently. This situation poses new problems for lenders with respect to credit policies, and an obstacle for those seeking entry into agriculture. High land prices in relation to earnings have helped encourage the use of low-equity installment land contracts which may lead to future financial difficulties. They also make it more difficult for farm programs to succeed in achieving a rate of return to investments in agriculture comparable to those earned in the nonfarm sector.

There is wide public interest in the reasons for the continued increase in land prices, and their most probable trend in the future. Research efforts are being increasingly directed to the factors other than farm earnings that have contributed to the upward trend in land prices, and of the probable effects of alternative farm programs. Definitive answers to such questions would provide a basis for more rational decisions by present land owners, prospective buyers, lending agencies, tax officials, and policymakers.

USDA PROGRAM

The work involves a continuing program of research designed to obtain current information on various aspects of the farm real estate market at the State and national levels. Statistical series are developed and maintained to periodically measure changes in market values of farm real estate, rates of farm transfers, methods of financing, and changes in the market supply of, and demand for, farm real estate. Two mail surveys are directed annually to farm real estate brokers and other informed people; additional information as to changes in market values, rates of transfers and cash rents are obtained periodically from the regular crop reporters of the Department.

The national research program is supplemented with cooperative studies with the State agricultural experiment stations directed toward special problems. Recent examples of such studies include an intensive survey of land buyers and sellers in Nebraska and Kansas, a detailed analysis of all bona fide land transfers in Illinois for a 5-year period, and a study of farm operators in Wisconsin who enlarged their farm businesses by either the purchase or rental of additional land.

Another continuing research program is directed to the estimation of gross and net rents payable for leased lands, annually by States. Such estimates are needed in calculating net income of farm operators by the Department of Agriculture, and in the national income accounts of the Department of Commerce. Rents also provide an important economic indicator to compare with the level and trend in market prices of land.

About 4.7 Federal professional man-years are currently devoted to all phases of the research program in farmland values and valuation. Of this total, 2.0 man-years are used on the current market developments phase of work; 1.5 man-years in analysis of factors affecting land values and transfers; 1.0 man-years on agricultural rents; and 0.2 man-years on program leadership. The cooperative study with the Kansas experiment station was terminated in the spring of 1961, and was replaced with the study now underway in Wisconsin. The study with Illinois is nearing completion.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

Most State experiment stations face continual demand for information on the levels and trends in farm real estate prices within a State. A number of stations conduct annual market surveys to fill this need in greater detail than is possible under the Division program. Currently, Minnesota, Iowa and North Dakota have annual surveys for this purpose. These States, as well as others, also occasionally initiate basic research to determine the forces affecting land values, and analyze the credit and tenure implications of such trends. The total effort devoted to all such research is estimated at 2.2 professional man-years.

Practically all of the research conducted by private industry in this field is for internal administrative use. Several of the major life insurance companies, some of the district Federal Land Banks, and a few of the larger commercial banks maintain research departments which occasionally study lending and appraisal experience, along with other economic developments that are relevant in guiding their lending policies.

Several national real estate appraisal and consultant firms offer their research services to clients on a fee basis. The National Association of Real Estate Boards maintains a research department for its members, but they do not cover the field of farm real estate in their periodic market surveys. The results of the Division's research are dissiminated through the trade publications of this organization.

No estimate can be made of the number of man-years of work performed by private industry.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Farm Real Estate Market Developments

Market prices of farm real estate have advanced at an annual rate of 4 or 5 percent a year since the fall of 1960. However, these increases have not been uniform throughout the country. They have been somewhat larger than the national average in most of the States in the Southeast and South Central portions of the country, and less than average in the Northeast and North Central States. These regional patterns bear no perceptible relationship to changes in farm income.

Market demand for farmland continues to come from established farmers seeking additional land to expand the size of their operations. In the year ended March 1961, 46 percent of all sales were for farm enlargement and 68 percent of the buyers were farmers. The rate of voluntary sales has declined to the lowest level since the mid 1920's. In the year ended March 1962, less than

100,000 voluntary sales occurred. Foreclosures and forced sales have remained at a very low level for the past decade.

New estimates have been developed also for the major classes of land used for agricultural purposes. It was found that about two-thirds of the total value of all farmland (excluding buildings) was accounted for by cropland. In the 13 semiarid western States irrigated cropland represented only 5 percent of the total land in farms, but made up more than a third of the total value. New estimates have been made of market values for the many kinds of land in California and Florida that are used for orchards, vineyards and other specialized crops.

The comprehensive analysis of land sales in Illinois is nearing publication. It will show that land transfers in the 1953-57 period were predominately smaller than the average farm and that such transfers were an important means for increasing the size of operating units. Sales prices advanced during this period at about the rate indicated by independent measures.

The study of the operations of the land market in Kansas showed many departures from the ideal of a perfect market. The majority of the transactions were between individuals within a local community with little formal competitive bidding. Nearly half of the buyers paid the price asked by the seller. The sellers, in turn, seldom followed any consistent procedure in arriving at their asking prices. Most frequently, they adjusted the price they had paid for the general increase in market prices since they had acquired the property. Others said that they based their asking prices on known sales of comparable properties. The major reason for the purchase of land was to enlarge the buyer's farm. Sellers most frequently cited advancing age and ill-health as their reasons for selling.

B. Analysis of Factors Affecting Land Values and Transfers

The Wisconsin study is nearing completion. It traces the adjustments made by farm operators in two areas of the State between 1951 and 1961 in the sizes of their farms, sources of credit used to implement these changes, and changes in tenure. The study also provided a measure of the number and characteristics of farm operators and of the farms that disappeared in this period. Out of 262 farms in the sample areas in 1950, 73 were no longer operated as farms in 1961. Of the 189 farms that remained, 147 were being operated by the same individual, whereas 42 had new operators. Each of these groups was studied further to determine why some farms expanded, and others remained static or disappeared. Rental, purchase of land, and the use of more credit were important elements in increasing the net income of those operators who made the greatest financial progress during the 10-year period.

Increased attention has been given during the past two years to various aspects of the market for farmland for nonagricultural uses. The supply and demand aspects of land for nonfarm purposes was found to reflect expected future uses to a considerable extent. The variations in market prices are considerably greater than for land for farming purposes. Some uses, such as for forestry and recreation, may command prices lower than for farming, whereas lands reserved for residential, commercial and industrial uses range well above agricultural values. A sample of sales of farmland for a wide variety of such uses has been obtained, and is currently being analyzed in considerable detail.

C. Agricultural Rents

Cash rents for farms and pasture continue to increase at about the same rate as market values. Rental shares for lands rented on a crop-share basis remain essentially unchanged. Consequently, the major causes of changes in the value of gross rents paid are variations in crop yields and prices received. Gross rents paid under all methods of renting were estimated at $3.4 billion in 1961. After deducting the expanses paid by landlords, net rents amounted to $1.8 billion.

An extensive review of the available literature pertaining to agricultural rents was completed with the publication of annotated bibliography. Considerably more attention has been given to the theoretical aspects of rent in British literature than in American publications. The close association between rents and land valuation was brought out in much of the literature.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Current Developments in the Farm Real Estate Market

Current developments in the farm real estate market. Three issues: ARS 43-138, Feb. 1961; ERS, CD-58, May 1961; ERS, CD-59, Oct. 1961.

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Singleton, C. B., Jr. and Scofield, W. H. Land syndication and the rural-urban fringe.

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Includes the following article:
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B. Analysis of Factors Affecting Farmland Values and Transfers

None.

C. Estimates of Agricultural Rents and Land Income - Land Values Relationships

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AREA NO. 8. ECONOMICS OF LAND USE AND DEVELOPMENT

Problem. The land resource situation is being affected significantly by population growth, urban expansion, and changing technology. There is increasing need for information on levels and trends in major uses, land improvement possibilities, desirable shifts in land use, and advantageous alternative uses from the standpoint of individual farms and the economy as a whole. Adequate land resource data and analyses are basic to studies of adjustments in land use made necessary by changing economic conditions, absorption of farmland for nonagricultural purposes, and increasing competition among alternative uses. They are needed to anticipate long-term requirements of land for agriculture, potential capacity to produce, and soil conservation needs.

USDA PROGRAM

The program of research in the economics of land use and development embraces five subareas of investigation: (a) land use inventory and classification, (b) land use patterns and changes within agriculture, (c) nonagricultural land uses, (d) conservation and land development, and (e) future national and regional demand and supply for land. This research provides a systematic and continuing inventory of major land uses, both farm and nonfarm, national and regional; analyzes trends in the nature and intensity of land use by counties, States, and regions, including shifts in major agricultural uses, reversion of crop and pastureland to brush and trees, and acreages absorbed by nonagricultural uses; appraises the national situation with respect to present and prospective changes in the use of rural land as they are affected by urban expansion and the competition of urban uses with agriculture; evaluates the extent, costs and returns of land improvement activities and practices; and analyzes the demand, supply, and use of land resources in terms of national output and nonagricultural land requirements.

Work is principally on applied research although particular segments of the overall program may be classed as basic research. The nature of the research makes it necessary to draw upon several scientific disciplines, including economics, statistics, geography, soils, agronomy, and forestry. Research is formally cooperative with the State Experiment Stations of Delaware, Iowa, Michigan, and Virginia. In addition, there is informal cooperation with many governmental agencies, several State Experiment Stations, and other organizations.

Approximately 10.6 Federal professional man-years currently are devoted to the overall research program in the economics of land use and development. Broken down by subareas of investigation, Federal professional personnel commitments annually are as follows: land use inventory and classification, 2.8 man-years; land use patterns and changes within agriculture, 0.3 man-years; nonagricultural land uses, 4.2 man-years; conservation and land development, 1.7 man-years; future national and regional demand and supply for land, 1.2 man-years; and program leadership, 0.4 man-years. Research undertaken for the Outdoor Recreation Resources Review Commission under a cooperative agreement was terminated in May 1962.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

The experiment stations are conducting research on the economic problems of land use under a diversity of conditions. Current experiment station projects cover: (a) opportunities and problems that arise in developing land for recreational uses, (b) changes in land use that have occurred or could occur as a result of reduction in flood risk, (c) effects of land acquisition by the Federal Government on local communities and on the State, (d) the economics of controlling undesirable plants on rangelands, (e) problems that arise in conjunction with expansion of city populations into previously rural areas, (f) the classification of land in relationship to use, and (g) the effects of the soil bank on land use and the possibility of using easements for bringing about desirable land use adjustments. Approximately 13.4 State professional man-years annually are devoted to this research.

Among the private organizations engaged in research related to land utilization are publishers of books and maps dealing with land, water, and transportation. Professional, trade, and business associations also conduct studies of land utilization. National and regional planning associations, commissions, and councils, in addition to nearly 500 consulting firms, are interested in research concerning urban and recreational land use planning. Several research foundations and privately endowed universities conduct studies embracing forestry, recreation, conservation, food requirements, use of watershed lands, and urban development. Fourteen State Departments of Agriculture sponsor annual State farm censuses to obtain data on number of farms, land in farms, cropland, and pasture and farm production. It is estimated that from 75 to 100 professional man-years are devoted annually by these groups and agencies to research in land use and development.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Land Use Inventory and Classification

A publication resulting from research dealing with land use inventories was released in 1962; it summarizes the extent and distribution of the major land use classes. This publication "Major Uses of Land and Water" is the latest in a series published at 5-year intervals since 1910. The principal results of this study follow.

The total area of the 50 States that comprise the United States is 2,314 million acres, of which 2,271 million acres is land and 43 million water. Of the total land area, 20 percent (458 million acres) is cropland; 28 percent (633 million acres), grassland pasture and range; 33 percent (746 million acres), forest and woodland; 2 percent (54 million acres), urban and other built-up; 5 percent (103 million acres), parks, wildlife refuges, wilderness areas, and other extensive special-purpose uses; 12 percent, (277 million acres), miscellaneous other land.

Nearly 60 percent of the land is cropland, grassland pasture, woodland, range, and farmsteads used directly in crop and livestock production. If all forest land, both grazed and not grazed is included, the total in agricultural use is 81 percent. Drainage has improved over 25 percent of the cropland, and irrigation, 7 percent. Ten percent or more of the farm pasture, likewise, has been improved by drainage.

An economic model for classifying farmland in the Great Plains was further refined and applied to land on the wheat-grass margin in Kimball County, Nebraska. This model utilizes returns to land and the break-even point between alternative uses to which the land is physically suited.

In the Kimball County application of this model, it was found that yields of wheat required to meet opportunity costs from use of soils for beef raising ranged from 6 to 8 bushels per planted acre, based on 1955-59 average prices and 1959 production costs. Changes in product prices or production costs would affect the break-even margin. For example, assuming 1955-59 average prices, relatively high nonland production costs for wheat and relatively low nonland production costs for beef, three soils considered physically suited for crop use would be submarginal for wheat. These three soils typically yield 6.3, 7.0, and 7.0 bushels of wheat per planted acre.

Results of the land classification study will be reported in a bulletin "The Economics of Classifying Farmland Between Alternative Uses, With Special Reference to the Crop-Range Margin in Kimball County, Nebraska." This bulletin will be published by the Nebraska Agricultural Experiment Station.

B. Land Use Patterns and Changes Within Agriculture

The publication "A Graphic Summary of Land Utilization," which is the latest in a long series published at 5-year intervals, presents an analysis of recent changes in land use. Addition as States of Alaska (with its vast area of rangeland, forest, and wasteland) and Hawaii (with its tropical crops and rangeland) resulted in great changes in the land use pattern for the United States as a whole. Other recent changes resulted largely from changing technology and growing population.

During the last 30 years, 30 million acres or more of poorly adapted cropland have been shifted to forest and pasture, while 10 million acres of new fertile land have been brought into cultivation. Substituting good land for poor, increased drainage of wet land, and irrigation of dry land have been important in increasing crop and pasture production.

The total cropland acreage in the 50 States dropped from 478 to 458 million acres, or 20 million acres (4 percent) from 1950 to 1961, and now is at the lowest point since 1910. The acreage of all cropland used in the production of harvested crops declined still more, 47 million acres, or 12 percent, from 1950 to 1961. Preliminary estimates show an additional decline of 12 million acres from 1961 to 1962.

Improved farm pasture acreage increased, but total grassland or nonforest pasture and range, including both pasture in farms and range not in farms was 22 million acres lower in 1959 than in 1930. Much of this change in total grassland pasture and range was by reversion to forest in the forest regions, and absorption by nonagricultural uses. A considerable amount of interchange between pasture and cropland has occurred in the principal agricultural regions.

Significant changes have taken place in the acreage and number of farms and other land absorbed by urban, industrial, highway, airports, reservoirs, and other developments. The average rate of absorption of all classes of rural land by urban and other built-up areas, including highways, roads, and

airports from 1950 to 1960 was about 1 million acres a year. Another million acres of rural land annually was set apart for more extensive special purposes, such as parks, wildlife refuges, watershed and reservoir protection, and other public uses.

An economic appraisal of changes in agricultural land use and ownership in Virginia reveals a high degree of mobility between ownership units in the study area. Of 9,452 acres in units of 140 to 220 acres in 1957, only 2,090 of these same acres were in this size class in 1930. A total of 7,362 acres moved into this size class between 1930 and 1957 while an almost equal acreage moved out.

C. Nonagricultural Land Uses

Research undertaken cooperatively with the University of Delaware on land use changes in the rural-urban fringe has resulted in two published reports, two manuscripts nearing completion, and growth of exceptionally fine working relations between research and planning personnel. The first published report presented land use, land value, taxation, ownership, and other statistics by minor civil divisions for the study area of New Castle County, and for the county as a whole compared with the other counties. The second report described and used a classification system for land use and landownership units designed to help planners solve problems occurring in the rural-urban fringes. The manuscripts nearing completion are about the use-prospects for privately owned idle land in the study area and the potential open space situation by 1980.

Major findings to date are that the proposed classification system works well as a research tool and is meaningful to planners but that some use-classes such as "commercial" and "industrial" require further subdivision and planners need data on tracts smaller than used in this project. These findings result from planner efforts to use the data in actual land use planning practice.

Excellent reception of the land use information produced to date has encouraged further efforts to develop data meaningful, useful, and necessary for sound land use planning in rural-fringe areas. New phases of the overall assignment will be oriented toward perfecting methodology for collecting and disseminating information about land and its characteristics for use by planners and decision-makers in urbanizing communities.

Research undertaken for the Outdoor Recreation Resources Review Commission under a cooperative agreement was completed. It resulted in two reports which have been published by the Government Printing Office as: "Potential New Sites For Outdoor Recreation in the Northeast," ORRRC Study Report No. 8, and "Private Outdoor Recreation Facilities," ORRRC Study Report No. 11.

The ORRRC study of potential new sites for outdoor recreation in the Northeast found that a surprisingly high number of "sites suitable for recreational development" exist even lying close-in to urbanized areas. The sampling procedure showed at least one of the potential sites in each 129 acres of forest, 1 per 258 acres of idle land, and 1 per 320 acres of pasture. Most of them occurred on land not well-suited to agriculture or to urban or industrial growth. Not all of these sites would be available for development for such reasons as unwillingness of the owner to sell the land or some other intended use, but opportunities still exist from the physical standpoint. Publicly owned resources frequently were poorly utilized for recreation use and

opportunities existed for improvements in the management of property at hand. Planning frequently was short-range and uncoordinated. Legal tools available often are not used fully. Areas suitable for some recreation purposes often are by-passed for public development because of agency policy on minimum size. Opportunities exist for greatly expanded recreation services on presently held public lands, from encouragement of private development in conjunction with public facilities, and from programs for new acquisitions and developments. (See also Area No. 10-D-4.)

The ORRRC study of private outdoor recreation facilities was based on replies from 4,045 questionnaires, 66 case studies, and analysis of problems encountered by private operators of recreation facilities. Of the individual activities, swimming was most popular, followed by fishing, boating, hunting, skiing, riding, picnicking, camping, and golf in that order. Several others were mentioned less frequently. Fees were charged by most of the enterprises inventoried. Approximately half of the operators reported problems. Of the problems reported, 72 percent are guest-created; 19 percent are related to the business operations; 5 percent are related to policy at various levels of government; and human relations, Acts of God, and legal problems account for the remaining 4 percent. Vandalism, trash, and fires, in that order, are the most frequently mentioned problems. They account for 75 percent of all problems.

Apparently there is no single optimum size of recreation business. It varies with the age and ability of the operator, the labor force available, location, seasonality of business, the degree and quality of competition, and other factors. High, relatively fixed costs that vary little with the volume of business are a burden for some types of business. Financing for both short-term and long-term loans is difficult. This hampers the smaller operations and businesses just starting out. Owners of large holdings who allow recreation-use on their lands recognize the need for recreation but have growing concern about the management problems encountered, the increasing demands for costly services, damage to property, risk of liability claims, and so forth. They urge public agencies to develop proper safeguards and rules to protect their interests in private property and enterprise.

Two short articles concerning industrial recreation areas and privately owned ski areas in the Northeastern United States were prepared for publication in recreation magazines. Both were based primarily on data collected for the report to the Outdoor Recreation Resources Review Commission.

A study of farms in Central Eastern Ohio that offer farm vacation opportunities is nearly completed. This study was designed to provide answers to questions farm people might ask about how to start this type of business, the kinds of services they need to provide, the costs and returns, the kinds of problems to be expected, and similar advice. Major findings are: (1) that a farm vacation business can be developed more easily where several farm families are interested in this means of supplementing their incomes, (2) opportunities are great for public employees to provide advice and assistance to families starting these enterprises, (3) the additional business created is of widespread economic benefit to the whole community, and (4) the interchange of ideas between farm families and city visitors benefits both.

A study of land use changes resulting from development of recreational and residential subdivisions in a mountain area of northern Virginia is almost

completed. Agricultural land uses in the area have continued to decline. Subdivisions planned for weekend and occasional recreational uses were frequently being adapted for residential uses. Soils, terrain, water supply, drainage, and plat layout frequently were inadequate for the new uses. Some counties have adopted area-wide planning, including zoning controls, in efforts to protect public interests. Others have done little planning for subdivision controls. Subdividers frequently complain that the controls adopted or proposed are too stringent, economically prohibitive, and unrealistic.

Service as secretary of the Committee for the 1963 Yearbook of Agriculture involved about 0.4 man-years of professional time for planning, outlining the chapters, contacting possible authors, and other tasks related to the assignment. The 1963 Yearbook will have as its theme, "Rural-Urban Relationships." Emphasis will be on how changing needs affect land use, related resources, and living conditions.

D. Conservation and Land Development

Participation in the National Inventory of Soil and Water Conservation Needs, 1957 to 1962, provided useful data on the land and water resources of the entire country. Aid was given in 1961 and 1962 in the review and analyses of major results of the Conservation Needs Inventory. These analyses have been released in USDA publications which include information on the present acreage of non-Federal land in major uses, the acreage of each use by land capability class, and conservation practices needed to maintain the agricultural land in a productive state.

Results of the Conservation Needs Inventory indicate that in the 50 States there are 638 million acres of non-Federal, nonurban land in capability classes I, II, and III. Land in these capability classes is physically suited for regular cultivation; about 58 percent of it currently is used as cropland. Approximately 169 million acres of class IV land is suited for occasional cultivation at high cost and with intensive conservation treatment. Of the class IV land, about 49 million acres, or 29 percent, is used for crops. There are about 644 million acres of land in capability classes V, VI, VII, and VIII. In general, land in these classes is not suited for cultivation, although approximately 25 million acres of this land is currently being used for cultivated crops. These data suggest that even though we have a substantial reservoir of land which may be converted to crop uses, some land presently in crops is not being used in accordance with its capability.

Soil and Water Conservation Needs data, particularly those relating to soils, land use, land capabilities, slope and erosion, are being used in current studies of land use, land and water conservation, and economic land classification procedures. Division personnel are working with the Soil Conservation Service in Washington, D. C. and with Statistical Laboratories at Ames, Iowa; Ithaca, New York; and College Station, Texas, where the data are being processed.

Work continued on an evaluation of agricultural drainage and related management of farms in Michigan. Procedures for establishing drainage districts and public drains were reviewed with special emphasis given to problems of financing. Records of 15 inter-county public drains were analyzed. Nearly one-half of Michigan ACP funds are for farm drainage systems, running as

high as 95 percent in some counties. Benefits from drainage are significant and from a normative standpoint may not merit the prevailing degree of public assistance.

A bulletin entitled "Michigan Drain Law as it Concerns Landowners" will report on some of the legal problems involving land drainage. This bulletin will be published by the Michigan Cooperative Extension Service. Several other manuscripts dealing with broad aspects of public drainage, conservation, and development programs have been prepared and cover (a) the differential impact that the conservation assistance program may have on various problem areas in agriculture, (b) criteria in selecting analytical procedures for evaluating public developments, (c) the impact of the Federal cost-sharing program in surplus commodity producing areas and low income areas, and (d) the potentialities of public investments for conservation and development as countercyclical fiscal measures.

In the second phase of the land drainage study in Michigan, 45 farmers have been interviewed in the Pickford, Silverwood, and Parkhill-Capec soil series areas to obtain cultural practice, drainage practice, and production data. These data are being correlated to determine the influence of drainage on economic productivity.

A brief study is in progress on the relationship between land use and the capability classification of the land.

E. Future National and Regional Demand and Supply for Land

Assistance was given to a recently completed Departmental study of possible farm production requirements in 1980 by providing estimates of the future national demand for land and the supply of land available to meet these needs. Principal assumptions underlying these projections were that relative to 1959, by 1980 (a) the U. S. population will have increased by 48 percent, (b) personal incomes per capita will have increased by 57 percent, (c) per capita consumption of all foods will have increased by 4 percent, and (d) per capita consumption of nonfood agricultural products will have decreased by 19 percent. Exports of agricultural products were projected at 30-35 percent above the 1960 level. Total cropland required in 1980 to meet projected demands was estimated at 407 million acres, a decrease of 51 million from the 1959 acreage. Harvested cropland requirements would total 291 million acres as compared with the 317 million harvested in 1959. An increase of 22 million acres of pastureland was projected to fulfill an anticipated increased demand for livestock products. Requirements in 1980 for special-purpose uses, which include urban and built-up areas, areas principally used for recreation or wildlife, and areas used for public installations and facilities, were projected at 196 million acres, an increase of 49 million acres from 1959 use.

Work is continuing at Washington, D. C. and in cooperation with the Iowa Agricultural Experiment Station on the future demand for and supply of land and water resources. The objective of this research is to develop a national model for use in (a) determining the interrelationships between agricultural requirements for land and water, and economic activity in other segments of the economy, (b) projecting optimum patterns of land and water use by agriculture under assumed alternative conditions, and (c) analyzing the intra- and inter-regional effects of proposed land and water resource development

projects upon existing and optimum patterns of resource use. This model has been conceptually formulated and theoretical implications explored. Currently, it is being empirically tested.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

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B. Land Use Patterns and Changes Within Agriculture

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E. Future National and Regional Demands and Supply for Land

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AREA NO. 9. ECONOMICS OF WATER USE AND DEVELOPMENT

Problem. The efficiency with which ground and surface water resources are managed in the agricultural sector of the economy has a direct bearing on the Nation's potential for continuing economic growth. Modest gains in the efficiency of agricultural water use will result in substantial increases of supplies effectively available for other uses, particularly in western regions where irrigated agriculture is an important segment of basin economies and water supplies are already inadequate for all beneficial purposes. Continued extension of irrigation to the East and emergence of water pollution as a problem of national concern make the economic management of water in agriculture in most areas an important factor in balanced economic growth and in the further expansion of all water-using industries, including agriculture itself.

The analysis of agricultural water management and development possibilities in such a setting requires basic data on the adequacy of existing water supplies in relation to various economic uses; information about quantities of water likely to be diverted from agricultural uses by industrialization, urbanization and related recreational needs; and knowledge of the extent to which basic water supplies might be effectively increased through such technologic advances as saline water conversion and weather modification, small-scale technologies and practices for more efficient water distribution and application, and watershed management for optimum water yields.

USDA PROGRAM

Current investigations are concerned both with providing economic facts on water supplies, uses, and management needs as they concern farmers, legislators, or administrators; and with analyzing resulting implications for water management decisions. Intensive studies are concerned with developing economic principles and techniques appropriate to the analysis of agricultural water problems; estimating the water values necessary for determining the feasibility and profitability of new water supply technologies or management practicies, small watershed projects or broad river basin programs; and with appraising various legal and organizational arrangements affecting the adoption of improved water use practices and with the implementation plans for multipurpose development of watershed and river basins. About 55 percent of the present USDA program can be termed basic economic research, with the remaining 45 percent representing applied economic studies and data collection necessary for both basic and applied studies. Major disciplines involved in addition to economics include agronomy, hydrology, engineering, statistics, and law. Aside from program leadership, about 35 percent of the research effort is centered in Washington, D. C. Major Washington studies include: (1) Compiling, analyzing, and interpreting source material on current and estimated future water use in relation to supplies, with particular emphasis on agricultural uses and their supply sources; (2) developing improved techniques for evaluating watershed and river basin development projects; (3) accumulating regional data on available land and water resources classified by productivity; and (4) analyzing regional irrigation trends and potentials in the eastern as well as the western States. These and various regional or State studies are grouped under any of the following 3 subareas of work: (1) Inventory and appraisal of water resource supplies,

uses, and values; (2) problems of water allocation and management efficiencies; and (3) water development potentials and agricultural requirements.

State and regional water inventory and appraisal studies are cooperative with the Colorado, Oregon, and Utah Experiment Stations; these deal primarily with estimating the value of water for irrigation and competing purposes in the Upper Colorado Basin and the Pacific Northwest. Water allocation and efficiency research is cooperative with 6 States. Involved are evaluations of the profitability of irrigation as a production technique on farms in Mississippi, Missouri, South Carolina, and Texas; evaluation of high water table problems on the Newlands irrigation project in Nevada; and research on the economics of watershed management in Iowa. Also included is a contract study with the University of Chicago on factors affecting the use and occupancy of rural flood plains in the United States. Water-development-potential research is cooperative with the Iowa Station, where econometric models for joint land and water planning are being developed and where the economics of land forming techniques for water management in the East are also being investigated. A California cooperative project deals with the economics of large-scale water conveyance facilities for irrigation and related purposes.

The total Federal research effort in the economics of agricultural water use and development currently runs about 11.3 professional man-years. Inventory and appraisal aspects of the program amount to 2.2 professional man-years; water allocation and management efficiency studies involve 5.6 man-years; about 3.1 man-years are involved in various studies on water development potentials and agricultural requirements; and 0.4 of a man-year is for general program leadership. The lines of work terminated since November 1960 were a study of the economics of watershed protection in Oklahoma, a study of high water table problems on the Newlands Reclamation Project in Nevada, and a study of the economics of irrigation in South Carolina. A preliminary report on the Oklahoma work suggested that inconclusive observations of land use change associated with flood plain protection be analyzed further under a cooperative SCS-ERS study of the impacts of the Washita Basin flood control program.

Regional research in which ERS is assisting through committee membership includes a Western regional project on the economics of integrated ground and surface water management, a North Central project on economics of water use in agriculture, a North Central project on hydrologic characterization of small watersheds, and work on water problems in the Southeast.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

State research on the economics of water use and development currently totals approximately 7.2 man-years. These allocations are in addition to Federal participation in the various cooperative studies described above. For example, California and Nebraska are independently studying the economics of ground-water irrigation. California is also investigating powers of public water districts and the relationship of water resource development to economic growth. South Dakota is appraising the Oahe Reclamation Project and Washington is examining adjustment opportunities in several irrigated areas of the State.

The current program of industry and other organizations totals from 40-60 professional man-years, including the research activities of State water data collection and planning agencies, such as the Illinois Water Survey. Much of the State agency effort is directed at obtaining factual data to guide water use legislation and operations of permit boards. Also included here is the water-related economic research conducted by the Tennessee Valley Authority as an independent Federal agency; economic research in the irrigation equipment industry; basic studies of such foundations as Resources for the Future, Inc., and the Rand Corporation in California; and the Harvard Water Program dealing with advanced techniques for formulating water resources projects.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Inventory and Appraisal of Water Resource Supplies, Uses, and Values

In connection with water use inventories and special appraisals of agricultural water use and supplies, three major reviews have been published. One is a compilation of all sources of available water supply and use data collected by such agencies as the U. S. Geological Survey and the Bureau of the Census. Each major source is described with reference to the type of data given, period and frequency of availability, geographic coverage, and overall completeness. The second review is included in a 5-year periodic inventory of land and water use in the United States (Agricultural Economic Report No. 13) and discussed the general role of water in agriculture, water situations and sources in the eastern and western States as well as trends and uses of irrigated and drained land. The report indicates that irrigation in the United States increased from 8 million acres in 1900 to more than 33 million acres in 1959 (nearly 36 million acres in 1962 if trends are extrapolated). Drainage increased from 7 million acres in 1900 to 102 million acres in 1960. The proportion of irrigation from ground water is increasing steadily, having grown from 17 percent in 1939 to 45 percent in 1959 and reflects full use of available streamflow in many irrigated areas of the West. The third review draws on these and other data in an overall comparison of trends and projections of agricultural and non-agricultural water use provided for the Department's Land and Water Policy Committee and appears in the Committee report "Land and Water Resources: A Policy Guide" issued in May 1962.

Concerning humid-area irrigation trends and potentials, analysis of final Census data shows that irrigation in the 31 eastern States declined by 297 thousand acres between 1954 and 1959, due largely to a $\frac{1}{2}$ million-acre reduction in rice grown in Arkansas, Louisiana, and Mississippi. About 2.3 million acres were irrigated in the East in 1959 compared with 1.5 million acres in 1949. The Department's Conservation Needs Inventory (CNI) indicates that nearly 19 million acres could be eventually irrigated in humid States on the basis of suitable soils and available water. An intensive economic study in the Piedmont and Coastal Plain in North Carolina seeks to estimate the production and water use impacts of supplemental irrigation drawing from soils for a statistical sample of plots surveyed in the CNI, as well as from crop response, water-supply and prototype cost data.

Studies of profitable farm allocations of limited irrigation water in the Upper Colorado Basin are nearing completion at Logan, Utah. A statistical report has been published on farm production practices and inputs in the

Strawberry Valley area. Another report undergoing editorial review deals with the profitable use of irrigation water in the Ashley Valley, an area to be supplied supplemental water from the Vernal Unit of the Central Utah Reclamation Project. The study indicates that average returns per acre-foot of water now range from $3 to $5, but that marginal returns associated with supplemental supplies may run to $10 per acre-foot. This work complements a study completed several years ago by Colorado State University under a research contract; the latter study indicated that marginal returns to additional water ranged from about $9 to $18 per acre-foot.

A current analysis of values of water for irrigation and competing uses in the Upper Colorado Basin at Fort Collins, Colorado has utilized multiple regression techniques to first derive values of shares of water stock involved in 800 farm sales occurring since 1954 in Boulder, Larimer, Weld, and Morgan Counties, and then to compute average water values from related information on deliveries per share. Final results are now being analyzed but published findings from an earlier sample of 44 farm sales indicate that marginal returns to additional irrigation water in the North Poudre Irrigation Company service area approximate $30 on a capitalized basis, and about $3 to $6 on an annual basis, depending on respective discount rates of 10 and 5 percent. Additional information on how institutional arrangements for reallocating limited water supplies under appropriative water rights has also been published under this project, and a descriptive study of financial and water-supply characteristics of over 100 irrigation companies in northern Colorado is being processed for publication. A comparable study of values of water for irrigation and competing purposes has just recently been initiated in the Pacific Northwest in cooperation with the Oregon Station.

B. Problems of Water Allocation and Management Efficiencies

Studies of supplemental irrigation in humid areas in Texas are nearing completion with publication of a final report on irrigated cotton production in the Middle Brazos River Valley. Four years of data indicate that irrigation can substantially increase cotton yields in the area but that many of the benefits may be offset by increased harvest expense and grade losses associated with heavy rainfall during harvest seasons. The study suggests an irrigation management program involving a reduced level of water use and fertilizer inputs, as well as a shortened irrigation season to minimize damage from wet fall weather. Net returns from irrigation could thereby be increased considerably over the $51 per-acre annual benefit of cotton irrigation under present management.

Research on supplemental irrigation in Mississippi has involved economic analysis of irrigation channel conveyance losses and comparative costs of sprinkler, gated-pipe and siphon-tube irrigation methods. Seepage losses from channels appear greater for clay soils than for sands and loams, largely because of severe cracking. Minimum seepage from sandy soils was associated with the sealing effects of incorporated silt particles. It was concluded, however, that artificial seepage-control measures would cost more than the value of the water lost under any soil conditions in the area. Evaporation losses from irrigation channels were found to be insignificant. The cost studies of different irrigation methods indicate that fixed costs as well as total annual cost per irrigation were lowest in the case of siphon tubes--annual fixed costs of $3.69 per acre and total annual costs

per irrigation of $17.90 per acre. The same cost items ($8.90 and $25.75) were highest for sprinkler irrigation; with gated-pipe representing intermediate cost levels ($7.01 and $24.35).

Economic appraisals of the use of water for irrigation in Missouri have concentrated on the problem of relating probable economic feasibility to the probability of various drought intensities as measured in drought days. Preliminary findings are that drought periods are quite prevalent in southeastern Missouri at least, and that irrigation appears feasible in most years, though probably not requiring equivalent water applications every year.

Studies of the economics of supplemental irrigation in South Carolina are completed, with approved publication of a bulletin on irrigation practices, costs, and returns for the period 1956-59. Average irrigation investments for the following farm types were: Peach, $12,200; tobacco, $6,700; dairy, $5,800; beef, $4,900; and general, $3,800. Rates of average annual irrigation returns on these investments ranged from a low of 1.17 percent on tobacco farms to a high of 14 percent on peach farms, with the latter followed by dairy farms at 4.27 percent, general farms at 3.26 percent, and beef farms at 2.91 percent.

In the now-completed study of high water table problems on the Newlands Reclamation Project, Nevada, a draft report indicated that significantly reduced crop yields associated with poor drainage could be at least partly restored with better irrigation methods and project-financed water-level control measures.

Research on the economics of watershed management continued at Washington, D. C. and cooperatively with the Iowa Station. A journal article reporting final results of the Spring Valley Creek Watershed research has been cleared for publication and a research bulletin will be prepared in the coming year. Although the study indicated that an optimum allocation of resources in the watershed as a whole is tantamount to an aggregation of optimum farm allocations programmed independently (due to insignificant interfarm problems of flooding and gully erosion), the on-farm benefits of such water management practices as terracing were noted to be significant in terms of complementary erosion reduction benefits. A published analysis of these benefits indicates that a commonly cited 5-ton-per-acre maximum permissible erosion rate in the Midwest would, at least in some cases, be more consistent with maximum farm income if stated as an optimum rate, since erosion near this rate could be accepted along with optimum farming systems.

Washington, D. C. studies on watershed management economics have included (1) preliminary work on analyzing crop yield and hydrologic data from the Blacklands Experimental Watershed near Waco, Texas; and (2) economic review and machine processing of data on potential watershed development gathered in the Department's National Inventory of Soil and Water Conservation Needs. The Department has published 2 inventory reports incorporating the material (Agr. Inf. Bul. 263 on Agricultural Land Resources and Stat. Bul. 317 on Basic Statistics of the Inventory) and detailed interpretive material has been provided for a third general report now in process. Development needs were inventoried for 12,802 tributary watersheds in the 48 contiguous States, Hawaii, Puerto Rico, and the Virgin Islands. Data were aggregated by States,

160 individual river basins, 18 major drainage areas, and, alternatively, 22 water resource regions. Flood plain protection and project measures for erosion control are necessary in 6,378 and 4,662 watersheds, respectively. Drainage and irrigation are feasible in 3,950 and 2,635 watersheds, respectively. At least 1,956 projects will involve recreation development and at least 834 will provide rural water supplies for purposes other than irrigation.

A contract study of the characteristics and use of rural flood plains in the United States is nearing completion at the University of Chicago. A final report is now being drafted; additional partial reports covering specific phases of the work have been completed. An unpublished working paper "Appraisal of Flood Plain Data" concerns the form and accuracy of land use and hydrologic data collected by various Federal agencies in their flood control planning activities. A second unpublished working paper "Methods and Problems of Taxonomy" discusses in theoretical terms the validity of classifying flood plains on the basis of central tendencies of observed characteristics. A third report "Types of Agricultural Occupance of Flood Plains in the United States," to be published by the University of Chicago, describes practical methods for classifying significant sets of flood plain characteristics. Another major report "Sampling, Coding, and Storing Flood Plain Data" has been published. This outlines the statistical theory of alternative land use sampling schemes, gives methods for correlating sample observations with secondary data sources, and illustrates a unique field method for punchcard coding and storage of sample data in which schematic land use and soils maps can be reproduced directly from the data cards. Additional reports in draft form include studies of changes in agricultural use of flood plains in the United States and problems in mapping critical combinations of flood plain characteristics as well as a study of the feasibility of preparing a generalized map of flood plains in the United States.

C. Water Development Potentials and Agricultural Requirements

Cooperative research with the Iowa Station on the economics of land forming for water management in the eastern States has involved compilation of costs of such land forming practices as land leveling, shaping and parallel terracing. Also, a preliminary study paper was prepared which traces the history of current interest in land forming in the East and, with respect to various land forming practices, outlines problems of definition, develops a physical-economic classification to guide economic evaluations, and summarizes available information and data regarding trends in their adoption and their associated benefits and costs.

Research on irrigation water conveyance systems in California has identified and analyzed several significant factors affecting the location and design of major conveyance works. The elevation difference between source and delivery areas was found to be a critical element for economic study; this difference greatly affects pumping costs and investment decisions. Other factors isolated through review of project documents and conferences with engineers include uncertainty in amount, location, and timing of future water demands; the influence of administrative pricing on water use efficiency; possibilities for acquiring rights to additional local supplies as alternatives to water importation; and the increasing importance of water quality considerations as irrigation return flows become a more important source of supply for subsequent uses. Preliminary study reports on various

phases of the project have been prepared under the following titles: "Economic Considerations in the Design of Major Water Conveyance Systems;" "Economic Design of Canals and Canal Structures;" "Economic Design of Gravity Tunnels for Water Conveyance;" "Economic Design of Pumping Stations in Water Conveyance Systems;" "Economic Design of Lateral Systems for Delivery of Irrigation Water;" and "Economics of Water Quality in the Design of Irrigation Supply Systems."

A joint land and water economics project on testing the adaptability of complex econometric models to interregional land and water planning problems continues in cooperation with the Iowa Station. Progress to date is reported under Area 8: Economics of Land Use and Development.

Limited research continues on the economics of flood control, drainage, land forming and bank stabilization in the Lower Mississippi Valley for the purposes of providing a comprehensive view of water resources development in a region where local, State, and Federal interests have long been active; and for indicating potentials for similar programs in other regions.

Work also continued on developing improved methods for evaluating water resource programs through participation with representatives of the Departments of Agriculture, Army, Interior, and Health, Education, and Welfare in the preparation of a statement on policies, standards, and procedures for the formulation, evaluation, and review of plans for water and related land resource developments. The statement was approved by the President on May 15, 1962, for application by the agencies concerned.

In addition to the research program carried on in Area No. 9, a substantial program of economic and statistical service work is conducted for the Department's river basin and small watershed protection programs through funds transferred for the purpose by the Soil Conservation Service; and for the Army Engineers, the U. S. Public Health Service, and other action agencies through funds transferred by those agencies.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

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Zimmer, J. M., and Stewart, C. E. 1961. Farm production practices and inputs, Strawberry Valley Project, Utah. Utah Agr. Expt. Sta. Mimeo. Rpt.

Gertel, K. 1962. Some important features of water use in the Southeast. In Water Law and Policy in the Southeast, Nov. 7-10, 1961. Proc. Southeastern Water Law Conference. Inst. of Law and Government. Univ. of Georgia. pp. 235-236.

Hartman, L. M., and Anderson, R. L. 1962. Estimating the value of irrigation water from farm sales data in northeastern Colorado. Jour. Farm Econ. 44(1), pp. 207-213.

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Wooten, H. H., Gertel, K., and Pendleton, W. C. 1962. Major uses of land and water in the United States: summary for 1959. U. S. Dept. of Agr. Agr. Econ. Rpt. No. 13.

B. Problems of Water Allocation and Management Efficiencies

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Landgren, N. E., and Anderson, J. C. 1961. A method for evaluating erosion control in farm planning. Agr. Econ. Res. 14(2), pp. 57-65.

Lanham, W. J., and Butler, C. P. 1961. Irrigation practices, costs and returns in South Carolina. S. C. Agr. Expt. Sta. Bul. 496.

Pavelis, G. A., Johnson, H. P., Shrader, W. D., and Timmons, J. F. 1961. Methodology of programming small watershed development. Iowa Agr. and Home Econ. Expt. Sta. Bul. 493.

Stewart, C. E. 1961. Economic problems of irrigation development in established dry farming areas: Lower Marias, Montana. Mont. Agr. Expt. Sta. Res. Rpt. 14.

Hughes, W. F., and Magee, A. C. 1962. An economic analysis of irrigated cotton production, Middle Brazos River Valley, 1955-58. Texas Agr. Expt. Sta. Misc. Pub. 580.

Berry, B. J. L. 1962. Sampling, coding, and storing flood plain data. U. S. Dept. of Agr. Handb. 237.

C. Water Development Potentials and Agricultural Requirements

Harrison, R. W. 1961. Early State flood control legislation in the Mississippi Alluvial Valley. Jour. Miss. History 23(2), pp. 104-126.

Contribution to: Agricultural land resources: capabilities, uses and conservation needs. 1962. U. S. Dept. Agr. Inf. Bul. 263.

Contribution to: Basic statistics of the National Inventory of Soil and Water Conservation Needs. 1962. U. S. Dept. Agr. Stat. Bul. 317.

Harrison, R. W. 1962. Decision making in national resource development: evaluation and cost sharing in national resource development programs. International Land Surveys and Farm Economics Division, ERS cooperating. Unnumbered Division publication.
Contribution to: Policies, standards and procedures in the formulation, evaluation and review of plans for use and development of water and related land resources. 1962. U. S. Senate. 87th Cong. 2d sess. Document No. 97. Wash., D. C. Govt. Print. Off.

AREA NO. 10. LEGAL-ECONOMIC PROBLEMS OF LAND AND WATER

Problem. There is both need and opportunity for improving the effectiveness and adequacy of laws, administrative measures and related institutional arrangements for influencing the use and management of land and water resources. Rapid rates of population growth, urban expansion, and technological change increase the need for improved measures to achieve an orderly and balanced pattern of land and water resource development and use. Additional research is needed on water law and its administration; rural zoning and other land use regulations; the organization and operation of resource districts such as soil conservation, drainage, irrigation, conservancy, and watershed districts; and property rights in land and the impact of public programs. Such information is needed by legislators, farmers, and public and private agencies concerned with means of implementing desirable patterns of resource use. The number and complexity of demands for information and technical assistance in this area have increased rapidly.

USDA PROGRAM

A continuing program of research is conducted in this area. The development and current status of statutes, constitutional provisions, and court decisions regarding water rights and associated laws in the 50 States are reviewed and analyzed. Rural zoning enabling statutes and local ordinances are collected and analyzed with emphasis on the current status of, and recent innovations in, zoning. Basic data are collected and analyzed on the feasibility of using easements, protective covenants, development rights, and similar arrangements to serve conservation ends and guide land use in rural areas such as in the Great Plains and in forest-farming and urban-farming fringe areas. Also analyzed are the feasibility of governmental purchase of cropping easements as a production control and land use adjustment device; incidence of benefits and impacts of public programs to control agricultural production; and farm impacts from highway construction and methods for minimizing possible disruptive effects. Some of these legal-economic analyses are carried out cooperatively with the Agricultural Experiment Stations of Arkansas, Missouri, Nebraska, North Carolina, and Wisconsin, and with the Wisconsin Law School.

A total of 7.3 Federal professional man-years currently is devoted to this research area, distributed as follows: Water rights and water legislation, 2.8 man-years; land use regulations, 1.0 man-years; resource districts and organizations, 0.7 man-years; property rights and impacts of public programs, 2.5 man-years; and program leadership, 0.3 man-years.

Work terminated during the period includes research under a cooperative agreement with the Outdoor Recreation Resources Review Commission for an analysis of laws, state agency procedures, cooperative State agency-private landowner programs, and local resource districts that would facilitate recreation development of rural land resources in 10 Northeastern States. Also terminated was an analysis of legal-economic problems of recreation development in Northern Wisconsin, a cooperative study with the Wisconsin Agricultural Experiment Station. A third study terminated was the analysis

of legal and economic aspects of water rights laws of Minnesota, Wisconsin, Indiana and Ohio, and their related Federal, interstate and international laws, programs and interests. This was conducted under a research contract with the University of Wisconsin Law School. Also terminated was a cooperative zoning study with the Arkansas Agricultural Experiment Station. For all these completed studies, the research findings have been, or are being, published.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

Few State Experiment Stations are conducting analyses of legal-economic aspects of water rights, zoning and land use regulations, resource districts, and impact of public programs on property rights. Illinois is analyzing legal rights which farmers have to various sources of water. Iowa is appraising productivity of water in different uses. Arkansas is determining the adequacy of its water laws in coping with emerging water use problems. Utah is analyzing water laws and other institutions that may apply to integration of ground and surface water supplies. Wisconsin is studying fiscal interrelationships among governmental units in connection with the forestry program. Iowa is surveying some property acquisition techniques for production control. Currently about 5.9 professional man-years are devoted to this work by the State Experiment Stations.

Owing to the scattered and periodic nature of much research on legal-economic problems by industry and other agencies, estimates of their professional man-years are impossible to make. Research in these areas may be a part of other research activities. State legislative, executive or ad hoc water resource study committees, and regional water conferences may do research on one or more phases of water rights or water legislation. Town or county planning and zoning commissions, regional planning commissions, and planning consultants may make action-oriented studies that involve one or more land-use control measures. Foundations may support studies that include problems of, or techniques for, guiding land use and water use. Universities and colleges other than agricultural experiment stations conduct research that relates to these subjects as well as to resource districts or organizations and to property rights and impacts of public programs. Probably some 20-30 professional man-years are devoted to this area of analysis, a relatively small amount in view of the legal-economic problems in resource use requiring analysis. Furthermore, much of this research deals only with a selected State, locality, or problem and does not adequately recognize agricultural aspects or provide the needed comprehensive research that is national in scope.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Water Rights and Water Legislation

1. The 31 Eastern States. Several reports have been prepared by the University of Wisconsin Law School under the above mentioned research contract in a study of legal and economic aspects of water rights in Wisconsin, Minnesota, Indiana and Ohio. Economic and related criteria were developed and employed to evaluate the water-rights laws studied. Constitutional questions, court-made and statutory laws of the various States, relevant roles of State and local governments and districts, and relevant

Federal, interstate, and international laws were analyzed. Field investigations were carried out to supplement library research and to answer questions such as how certain permit systems administered by State agencies have operated in actual practice.

The completed studies have revealed, among other things, that water rights and related laws in the States covered are quite complex and are unsettled regarding a number of important questions. Findings also indicated that physical and economic factors and water-rights problems varied substantially from area to area among and within the four States studied, suggesting that it may be desirable to tailor planning procedures and remedial measures to cope with the problems of separate areas.

The contract has been completed and an agreement with the University of Wisconsin has been made to review, supplement and publish the findings. Two of five publications that will include the findings are in progress. They deal with water laws in Wisconsin and Minnesota. Cooperative research now underway with Wisconsin will lead to publication of a book on water laws in the 31 Eastern States.

A manuscript on water-use laws in Illinois has been prepared, is being revised, and will soon be submitted for publication in cooperation with the Illinois Agricultural Experiment Station. Its coverage is similar in many respects to several of the reports prepared for neighboring States under the Wisconsin contract. Research is underway on a similar study of water laws in Arkansas being conducted in cooperation with the Arkansas Agricultural Experiment Station. A comprehensive bibliography of publications on water-rights laws in the United States and related subjects is in press, and work has begun on a supplement to this bibliography.

Papers were prepared for delivery at various conferences. Subjects researched and reported on were rights to water supplies in the Eastern States, water laws in the Eastern States as related to water resource development, and the regulation of water use in local areas by State and local governments and districts. Coleadership was provided in the development and conduct of the Southeastern Water Law Conference Nov. 8-10, 1961.

Combined findings from the various studies indicate that a wide variety of legislation (including various statutory permit systems) has been enacted or is under consideration, ranging from extensive State administration of water use to relatively minor modifications of the common law. Some legislation has tended to clarify water rights while other statutes have led to some confusion regarding their application. Notwithstanding such legislative activity, court-made law, including the riparian doctrine regarding natural watercourses, is still predominant in many of these States. One broad issue in developing new or remedial legislation is how to provide sufficient certainty or security to encourage desired investments in water resource development and use while also providing sufficient flexibility to safeguard public rights or interests and keep water use abreast of changing conditions. Findings to date have indicated the necessity of a thorough understanding of existing water laws and conditions in a State as a preliminary step to changes in the laws. Studies of the existing laws and alternative possibilities and the collection, organization

and analysis of pertinent physical, economic and related data are a prerequisite to informed judgments regarding legislative changes, remedial administrative measures, and operation of existing or new laws.

2. The 19 Western States. The comprehensive review and analysis of laws concerning water rights in the 19 Western States (including Alaska and Hawaii) was continued.

Substantial progress was made in the preparation of a publication that includes a comparative analysis of the water rights laws of all the Western States. Enough work has been completed to approximate one volume of a contemplated two-volume work. Subjects covered to date include State water policies, classification of water supplies, characteristics of watercourses, navigable waters, water rights systems pertaining to watercourses in general, and summaries of the operation of the appropriation and riparian systems of water rights in each of the individual 19 Western States. Interrelationships of the dual systems in each of the States in which both systems are concurrently in operation are presented and discussed. In addition, an article "Riparian-Appropriation Conflicts in the Upper Midwest" was published in the North Dakota Law Review. A separate report on the law of water rights in Texas was published by the Texas Board of Water Engineers with funds specifically provided by the Texas Legislature in the appropriation act for the biennium ended August 31, 1961. The Texas book, covering 720 pages, is the ninth such report for an individual State. Such publications are extensively used by public and private agencies and organizations, legislators, courts, lawyers, engineers, economists, farmers, credit agencies, teachers, researchers, and students, and by many others concerned with water rights and related problems who seek answers written in everyday language.

B. Land Use Regulations

Research on rural zoning progressed substantially along two lines: the analysis of zoning enabling statutes and the analysis of local ordinances. Data were obtained, tabulated and analyzed for the major provisions of about 300 rural zoning enabling statutes that authorize various governmental units or agencies to zone unincorporated or rural areas. A preliminary draft of a manuscript describing and evaluating these enabling statutes is now in process. Also, through contacts with officials in all states, a listing was prepared of all counties, towns, or other governmental units that have passed zoning ordinances. Copies of the local zoning ordinances are being obtained and analyzed, and findings are being tabulated. Emphasis is being placed on identification of innovations in rural zoning.

Analyses in these two general areas indicate that zoning enabling laws exist in all 50 States. They empower all or selected counties, towns or townships, cities, or other units of government, including State boards or commissions, to zone areas outside corporate boundaries. Extraterritorial zoning by cities and towns for distances from 1 to 3 miles outside their boundaries is growing in favor. Also, a good beginning has been made with zoning at State levels.

Zoning ordinances have been passed by about 400 counties in 33 States and by more than 1600 towns or townships in 9 States. Copies of zoning ordinances have been obtained for 165 of the 400 counties.

Farm zoning districts for agriculture and related uses only were developed in California about a decade ago. Such districts are now found in 8 States, including Hawaii, where the districts were established by a State agency. Many new types of zones have been formed, including recreation-farming, floodway, flood plain, conservation, watershed, open space, and historic zoning districts.

C. Resource Districts and Organizations

Lack of needed personnel has seriously limited research in this area. Some analysis of local resource districts has occurred as part of other research underway. Research in water law has shown a number of different ways in which water use may be regulated by local governmental units or districts. Some of these are reported in the Proceedings of the Southeastern Water Law Conference held in Athens, Georgia, in November 1961. Likewise, research in land use regulations has described the variety of land use regulatory zones established by local units of government. Research in property rights and impacts of public programs has shown the importance of bringing such districts as soil conservation, drainage, irrigation, and fire protection into the highway planning process. It also has shown that local fish and wildlife management districts have successfully developed a variety of arrangements for allowing controlled public hunting on private lands. However, because of other service and research demands on personnel, a needed comprehensive analysis of resource districts, their functions and their improvement is still to be undertaken.

D. Property Rights and Impacts of Public Programs

Research in this area has been continued along three related lines.

1. Use of easements for production control and land use adjustments. An analysis is being made of the feasibility of governmental purchase of crop restricting easements. The easements would restrict production of grain and tilled crops but would allow establishment and use of permanent grasses. As the need arises, the cropping easements could be released, rented, or sold back to landowners.

A legal analysis made cooperatively with Missouri and Nebraska shows that in those two States there is no direct legal prohibition on the purchase of crop restricting easements by the Federal government. However, the transfer of crop restricting easement would have to be accomplished with care, considering variations in the laws of different jurisdictions. A manuscript reporting the detailed legal analysis is being reviewed for publication.

A further analysis was made in six Nebraska Counties to examine reactions of landowners to a hypothetical-Federal program based on the acquisition of crop restricting easements. Responses by landlords and owner-operators show that these easements could be purchased for all periods of time at less than the total land values. The initial cost of acquiring the easement would be

greater than the cost of renting the cropping rights from the owner. However, during any period extending beyond 6 to 10 years, the cost of supply management would be considerably less by purchasing crop restricting easements than by renting the cropping rights. Savings would occur both in the level of payments to landlords and owner-operators, and in the cost of administering compliance checks. Procedures used in the study have been published in the Statistical Reporter. Two preliminary reports of findings are now in draft form and being reviewed for publication.

Personnel also served on a task force on expanding grassland on farms and ranches established by the Department. Problems and opportunities for expansion of grasslands were analyzed; studies of conversion of cropland to grassland were reviewed; and a program for expanding grassland was developed. The task force report is now being published.

2. Effects of public programs on use of agricultural resources. Some progress has been made in analysis of the economic role of land resource institutions in agricultural adjustments. Some findings were presented to the Western Agricultural Economics Research Council. Others were reported at a conference on "Dynamics of Land Use--Needed Adjustments" held at the Iowa State University Center for Agricultural Adjustment. Analyses indicate that some institutions have been instrumental in fostering misallocations of resources between agricultural and non-agricultural uses, within agriculture, and between time periods. Criteria were developed for reorienting research.

3. Effects of highway land acquisition on farms. A third line of continuing property rights research involves analysis of immediate effects of highway land acquisition on property owners and operators. Progress was delayed by diversion of research personnel to other pressing service and research activities. However, analyses made of laws and highway department procedures and results of questionnaires obtained from over 200 farm owners and operators in 5 Wisconsin counties indicated the following. In 1957-59, most property owners and operators losing land to the high-design Interstate highways in the 5 Wisconsin counties were dissatisfied with acquisition procedures used and with compensation paid them. They desired adjustments in both. Regarding procedures, owners and operators desired (1) means for local groups to enter the highway planning process; (2) information on procedures the highway agency would use; (3) early knowledge about location and acreage of right of way required; (4) opportunities to point out items of land value to appraisers: (5) the right to inspect appraisals approved by the highway agency; (6) the choice of selling to the highway agency or retaining any land remnants or entire units badly severed; (7) more time to move objects from the right of way or adjust their units before construction; and (8) relief from drainage and soil erosion damages caused by the highways. Regarding compensation, owners and operators desired to be compensated for (1) damages resulting from change of grade, (2) realignment of personal property, (3) movement of personal property to a new location, (4) soil erosion and drainage losses, and (5) some other items noncompensable under the then existing law. New Wisconsin eminent domain laws passed to improve acquisition procedures and broaden the elements of compensation also were analyzed.

Demands for results of this research, requests for technical assistance, and service work have been particularly heavy. These demands have made necessary the declination of invitations to present papers to seminar and national conferences. Two technical papers were prepared for the 47th Annual Road School sponsored by the Civil Engineering School of Purdue University. Radio tape and news releases of findings were prepared. In addition, many letters received by the Department requesting information or assistance were answered.

The professional person responsible for this research was requested to serve as a technical adviser to the Select Subcommittee on Real Property Acquisition of the House Public Works Committee. He is assisting in a comprehensive analysis of the adequacy of existing laws, practices, and procedures in the acquisition and valuation of real property acquired for all Federal and Federally-assisted programs.

A final report of research is now in process. An earlier study of the effects of highway land acquisition on farm operating units along Interstate route 35 in Iowa was published as an ERS document.

4. Related work now terminated. A study was completed of alternative administrative procedures and laws for making land and water resources available for public recreational uses. It constituted a major contribution to a research report, now published by the Outdoor Recreation Resources Review Commission, "Potential New Sites for Outdoor Recreation in the Northeast." Specific and detailed recommendations were made regarding (1) comprehensive and coordinated planning; (2) efficient use of available resources; (3) development of smaller areas for recreation; (4) use of municipalities, special-purpose districts, and land owners to assist State agencies; (5) encouragement of private recreation developments; (6) review and development of legal powers; (7) procedures in applying acquisition powers; and (8) needed research. Some findings of the report also have been presented at a resource development seminar sponsored by the Great Plains Agricultural Council. (See also Area No. 8-C.)

Also completed was an economic analysis of measures for guiding the use of water and privately owned rural land resources for recreational purposes in Wisconsin. A manuscript now in process reports research on resort and related lake shore developments in Washburn and Sawyer counties, Wisconsin. It describes (1) physical resources and characteristics of recreational lands; (2) economic and related characteristics of summer resorts, summer homes and recreational area development; (3) problems observed, including haphazard and unsightly developments, taxation problems, and access problems of the recreating public; and (4) possible remedies for problems observed.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Water Rights and Water Legislation

Ellis, H. H. 1961. Regulation of water use in local areas by State or local governments and districts. In Water Law and Policy in the Southeast: Papers Prepared for Presentation at the Southeastern Water Law Conference, University of Georgia, Nov. 7-10, 1961. Institute of Law and Government, University of Georgia, in cooperation with The Farm Foundation and The Southeastern Land Tenure Research Committee. pp. 238-284.

Ellis, H. H. 1961. Rights to water supplies in the Eastern States. In Papers presented in the Southern Water Resources Conference, Richmond, Va., Sept. 13-14, 1961. The Council of State Governments, Southern Office, Atlanta, Ga.

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Hutchins, W. A. 1961. The Texas Law of Water Rights. The Texas Legislature and Texas Board of Water Engineers, in Cooperation with the U. S. Dept. of Agriculture. 720 pp.

Hutchins, W. A. 1962. Riparian and appropriation conflicts in the upper Midwest. 38 N. Dak. Law Review. 278-301.

B. Land Use Regulations

Solberg, E. D. 1961. New Laws for New Forests. University of Wis. Press. 611 pp.

Solberg, E. D. Nov. 1960. Reserving open space for the future. Cornell Planners Conference. Cornell University, Ithaca, N. Y.

Solberg, E. D. Nov. 1960. Shaping new measures for reserving open space. Cornell Planners Conference. Cornell University, Ithaca, N. Y.

Solberg, E. D. Nov. 1960. Zoning to protect agriculture. Agr. Extension Division, University of Minn., St. Paul.

Solberg, E. D. Feb. 1961. Planning and zoning of rural areas. Minn. Farm Business Notes, University of Minn., St. Paul.

Solberg, E. D. June 1961. Some requisites and objectives of rural land zoning. School of Agriculture, University of Del., Newark.

Solberg, E. D. Aug. 1961. Progress of land zoning in the United States. Soil Conservation Society of America, Lafayette, Ind.

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Solberg, E. D. 1962. Zoning for rural areas. U. S. Department of Agriculture, Leaflet No. 510.

Solberg, E. D. June 1962. Planning and zoning to prevent land and water problems in suburbia. Urban Extension Agents Conference Farmingdale, N. Y.

Solberg, E. D. June 1962. Rural zoning. American Society of Agricultural Engineers Conference, Washington, D. C.

Witte, A. M., Solberg, E. D., and Martin, L. R. 1962. Arkansas Agricultural Experiment Station. Bul. 657.

C. Resource Districts and Organizations

None

D. Property Rights and Impacts of Public Programs

Chryst, W. E., and Timmons, J. F. 1961. The economic role of land resource institutions in agricultural adjustment. In Dynamics of Land Use--Needed Adjustment. Iowa State University Press. pp. 252-277.

Chryst, W. E. 1961. Some aspects of land ownership and efficiency of resource use from the public viewpoint. In Proceedings, Western Agricultural Economics Research Council.

Griffing, M. E., and Ellis, H. H. July 1961. Study of possible purchase of cropping easements from landowners. Statistical Reporter. U. S. Bureau of the Budget.

Pendleton, W. C., and Vlasin, R. D. 1961. The impact of Interstate highways on rural areas. Purdue University Engineering Bul. XLV (6) pp. 92-109.

Pendleton, W. C. and Vlasin, R. D. 1961. The impact of Interstate highways on rural areas. Virginia Highway Bul. 27 (6) pp. 1-3, 34-36.

Vlasin, R. D. 1961. Measuring the benefits of developing and maintaining recreation resources--issues and approaches, as discussion. Recreation Research in the Great Plains. Great Plains Resource Economics Committee, Great Plains Agricultural Council. South Dakota State College. pp. 56-65.

Vlasin, R. D. 1961. Planning controlled-access highways in rural areas. Purdue University Engineering Bul. XLV (6) pp. 162-169.

Johnson, H. A., Dill, H. W., Jr., Vlasin, R. D., and Wagner, R. R. 1962. Potential new sites for outdoor recreation in the Northeast. ORRRC Study Report No. 8. U. S. Government Printing Office.

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AREA NO. 11. LAND TENURE

Problem. Improvements in the security, efficiency, and general well-being of farm people and others can be achieved through better tenure arrangements. At the farm level, research is needed to develop tenure devices which provide efficient, flexible, and expanding farm units. For guiding policies and programs, research also is needed to determine the effects of economic change on the adjustments in the relationships among resource owners and resource users and to determine the impact of various public measures on access to resources.

USDA PROGRAM

A continuing program of research is conducted which includes collection and analysis of data on basic land tenure changes and trends, patterns of landownership, forms of tenancy and other devices for resource control; analysis of the effects of alternative types of tenure and leasing arrangements on farm efficiency, farm size, investments, and the distribution of costs and returns; and analysis of the nature, relationships, and economic implications of changes in conditions under which farmland is acquired, held, and transferred. Consideration is given to the economic implications of land tenure arrangements and to the legal and institutional framework within which such arrangements operate. Much of the program is carried out cooperatively with the Agricultural Experiment Stations in several States and Puerto Rico; the Agricultural Law Center, State University of Iowa; and with Regional Research Committees in the Great Plains, North Central, and Southern States.

The total Federal professional man-years currently devoted to the area amount to 13 man-years, of which 0.3 man-year is devoted to program leadership. The remaining 12.7 man-years are distributed as follows: basic information on farm tenure, 2.8 man-years; analysis of farm tenure arrangements, 5.4 man-years; and analysis of pattern and structure of resource ownership and control, 4.5 man-years.

Work terminated during the period reported includes a research contract with the Research Triangle Institute, Durham, North Carolina, and research studies on the effects of Social Security on farm tenure, the relation between contract farming and farm tenure in North Dakota, and economic-legal aspects of farm tenancy in Iowa. Projects terminated and either combined with other projects or redirected include research on the influence of tenure arrangements on farming efficiency and the relation between farm tenure arrangements and agricultural production control programs in the Southeast.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

The determination of trends in farm tenancy and ownership within States is a continuing research function of the Experiment Stations. Most of the basic data for this research is obtained from the Census and from enumerations of the Department of Agriculture. Research is directed to specific problems of States, and includes studies of the relationship of tenure to the level of economic activity, the effect of ownership transfers and

leasing arrangements on farm income and efficiency, and problems arising from the use of such tenure devices as corporations, vertical integration contracts, purchase contracts, and others. Important contributions to tenure research are made by the States and the Division through the regional land tenure research committees. The North Central States have recently initiated regional project NC-53 "Needed Adjustments in Land Tenure to Meet Changing Agricultural Conditions." Attention is being given in the contributing studies of this project to the number of future opportunities in farming and the impact of the declining number of farming opportunities on the occupational decisions of young people in rural areas. Currently 4.9 professional man-years are devoted to this work by the State Experiment Stations.

Public institutions such as privately financed foundations make investigations of tenure problems, including studies of foreign land tenure and land reform. Support for regional land tenure research committees is provided by the Farm Foundation. Studies of the social and economic aspects of land tenure are supported by the Robert Schalkenbach Foundation. Some legal research related to land tenure is supported by the American Bar Foundation. Studies of foreign land tenure problems are supported by the Rockefeller Foundation and the Ford Foundation. A broad estimate of the current contribution to tenure research from these sources is 10 to 20 professional man-years.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Basic Information on Farm Tenure

Cooperative studies of landownership were completed and published by the Kansas and North Dakota Experiment Stations, using data collected in a 1957 study of landownership in the Great Plains. These studies emphasized changes occurring in ownership within the State since 1945. Further use of 1957 studies of farm tenure and landownership in the Great Plains is being made in a cooperative study with the Oklahoma Experiment Station, which will analyze tenure-size aspects of farm adjustments and relate them to selected income, resource use, and tenure variables.

A study of landownership in the Southeast States, which was conducted under a now completed research contract with the Research Triangle Institute, is being prepared for publication. The study touches upon many aspects of landownership in major regions of the Southeast, including characteristics of landowners; the type, area, and use of land owned; how land was acquired; the concentration of landownership; shifts in land use; and other attributes of land and owners. A cooperative study with the Tennessee Experiment Station using the data for Tennessee has been completed and a draft manuscript prepared. The study estimates that there are about 251,000 owners of rural land in Tennessee, about 70 percent of whom were husband and wife and who owned about 68 percent of the rural land. Ninety-five percent of the landowners live in Tennessee. The major shifts in land use were of woodland to cultivated land (55,000 acres) mostly by farmers, and cultivated land to urban uses or idled (about 143,000 acres) mostly by retired farmers and others who were not full-time farmers. Another study to analyze State data from the survey has been initiated with the Alabama Experiment Station.

Results of a regional project studying the relative efficiencies of alternative tenure arrangements in Iowa, Missouri, Nebraska, and Kansas have been reported in three Master of Science theses and one Doctoral dissertation in the cooperating States. One regional publication and three State publications reporting separate phases of the project are being prepared from the studies. Findings from the regional report reveal few differences between the tenure classes as to efficiency of resource use, partly because of the similarity of farming practices on farms of the same size. Farms in each tenure class had capital limitations that affected investments in improvements and better practices. Owner-operators had greater net worth than did tenants; however, the income earning opportunities of tenancy were superior to ownership of a small farm. The studies indicate that many farms were far from the optimum in size and in combinations of resources, having excess labor and machinery for the acreages and enterprises involved.

Work continued on the graphic and statistical summaries of farm tenure, and a manuscript has been submitted for the former. A statistical supplement to the report of a 1957 survey of the tenure and financial condition of Great Plains' farmers was prepared and published.

Several papers were prepared that explored and analyzed basic tenure relationships and research methodology. These include an analysis of the effect of population growth on investment potential, presented at a conference of the Association of Southern Agricultural Workers; and a paper on tenure factors to be considered in demographic research, presented at a Conference on Southern Population.

A manuscript on the scope and methods of land tenure research was prepared and submitted for publication. This manuscript is a product of the Inter-regional Land Tenure Research Committee and involves a reexamination of previous statements on land tenure research needs and approaches. A bibliography of land tenure research in the United States, 1955-60, is being prepared to accompany the manuscript.

B. Analysis of Farm Tenure Arrangements

1. Revised editions of the Department's leasing materials were published. These include three Farmers' Bulletins dealing with general leasing problems such as factors bearing on landlord-tenant relations, the nature of farm lease contracts, and rent determination procedures; three lease forms with three explanatory bulletins; an annual supplement to be used with any of the lease forms; and a farm lease checklist to aid in filling out the lease.

In cooperation with the North Central Land Tenure Research Committee, a seminar on rent theory and renting practices was held to evaluate basic problems of farm leasing. The proceedings of the seminar have been approved as a North Central Regional Publication and a bulletin is in process of publication at the Missouri Agricultural Experiment Station.

Farm tenure arrangements in the Great Plains and the interrelations of these arrangements with physical, social, and other economic characteristics of the Plains were evaluated in a seminar held by the Great Plains Resource Economics Committee. The formal papers and discussions presented have been processed and distributed by the North Dakota Agricultural Experiment Station.

Requests for information on leasing practices, rent determination, and related leasing matters received from landowners, tenants, and program administering agencies of the Department are fulfilled through use of the Department's leasing materials and other research studies, by referral to State Experiment Stations where appropriate, and by direct replies and assistance to persons or agencies involved.

2. The first two phases of a research contract with the Iowa Agricultural Law Center for an analysis of legal-economic aspects of contract farming ("vertical integration") were completed. The first phase involved the collection and preliminary examination of contracts and the second phase was mainly concerned with a legal-economic classification of contractual provisions. Two reports have been prepared covering the study to date; the first report is a nontechnical discussion of the law of integration contracts while the second is a summary of 35 principal contractual provisions covering 9 of the 71 commodities included in the study. Of the 900 contracts collected, 420 are being examined further; contracts with limited significance for farming operations have been excluded. The third phase of the study is nearly completed; it involves formulation of a system to classify contracts on the basis of the extent of the shift of management from the farmer to the off-farm firm. Contracts are being classified on a scale representing the degree of integration which takes account of management and marketing decisions, ownership of inputs and products, and risk-bearing in production and marketing.

The results of a study of the economic relations between contract farming and farm tenure in the sugar beet area of the Red River Valley of North Dakota were published.

3. Progress has been made on several phases of an appraisal of the economic aspects of land tenure law. One phase of the cooperating Iowa Agricultural Law Center's technical legal research on land contracts, "Forfeiture and the Installment Land Contract," was published in the Iowa Law Review. The processing and integration of the library study, field interviews, courthouse survey, and analysis of contractual provisions of actual land contracts are virtually complete. The outline of the report has been completed and writing is proceeding on various sections.

The Farm Credit Administration is now cooperating with the Iowa State University for a restudy of the 154 installment land contracts involved in the present analysis at the Agricultural Law Center. The primary aim of the study is to determine whether this form of low-equity financing has been successful in obtaining control of necessary capital.

As a phase of the water rights study, a report, "Iowa's New Water Statute--The Constitutionality of Regulating Existing Uses of Water," was published in the 1962 spring issue of the Iowa Law Review. It is an expansion of the presentation on the same subject given at the Water Rights Conference at Michigan State University in the spring of 1960.

Work has been initiated at the Iowa Law Center on a 2-part study of farm partnerships. A manuscript from the library research was published in the 1962 spring issue of Iowa Law Review. A questionnaire for a field study of farm partnerships is nearing completion.

A manuscript on the legal aspects of leasing has been prepared under a cooperative project with the Law School and Experiment Station of the University of Nebraska. This is one of several studies being carried out at Nebraska under a larger project concerned with legal-economic analysis of selected tenure arrangements.

Attention was given to legal and economic considerations of farm transfer and operating arrangements. Under the cooperative project at the University of Nebraska a manuscript was prepared from a study of legal aspects of intrafamily transfers of land and an article on the law of gifts to minors was published in the Nebraska Law Review. One of two North Central Regional studies on family farm transfer and operating arrangements has been published and the other is in press. These publications discuss family farm operating agreements and outline techniques used by farm families in their efforts to retain farms in family ownership and minimize the disruptive effects of intergeneration transfers of farms. A Department Farmers' Bulletin on father-son operating agreements was issued. This is a revision of an earlier bulletin which was brought up to date with respect to new developments in farm incorporation, social security, and other tax considerations.

C. Analysis of Pattern and Structure of Resource Ownership and Control

1. Research on the application of the corporate form to farms is being conducted cooperatively with the Agricultural Law Center, State University of Iowa, Iowa City, Iowa, and the Iowa State University, Ames, Iowa. Research has progressed in four phases: (1) a determination of the incidence of farm incorporation in Iowa and an annual review of new incorporations, (2) a field study of 20 randomly selected Iowa farm corporations, (3) legal analysis of the corporate form, and (4) economic analysis of the corporate form as it is applied to the farm firm.

Research on phase I for prior years has been completed and the annual review is complete up to December 31, 1961. As of that date, approximately 225 farm corporations were in existence in Iowa. A substantial proportion of presently existing farm corporations have been formed since 1958. Preliminary findings in the phase II field study have been published. Among other things, the study found that almost all existing farm corporations are closely held in terms of ownership and most of the owners are related by blood or marriage. The size of incorporated farms averaged somewhat larger than the average size of all farms in Iowa.

A manuscript based upon phase III research has been prepared for publication as a book for use by practicing lawyers, researchers, farm advisers, and farmers. The manuscript covers economic considerations in choosing a form of farm firm organization; history of the corporate form; incorporation procedure; corporate financing; corporation management and control; stock transfer restrictions; liability; intergeneration property transfers; valuation of stock and corporate property; income tax considerations; employee status; out-of-State relations; settling internal disputes; and bankruptcy, dissolution, and liquidation.

Phase IV will involve application of linear programing to determine the effects of incorporation upon resource use, income distribution, tenure stability, and intergeneration property transfers. This phase has not progressed to the findings stage.

Cooperative legal-economic research at the University of Nebraska has been directed to obtaining information on the extent of farm incorporation in Nebraska, enterprises, and size of operations. A mail survey was made of probable farm corporations in Nebraska, following which a more detailed interview survey was made of the legal and organizational problems of a small group of corporations. A manuscript of this study has been prepared and is awaiting publication in the Nebraska Law Review. The study found, among other things, that farm incorporation was not widespread in Nebraska, and among small farms is almost nonexistent. Ninety percent of the corporations either had very substantial holdings or were engaged in other enterprises. Corporation farming is concentrated in a few areas, where large farms or ranches predominate, or near the larger cities. However, there seemed to be no general evidence that incorporation was either superior or inferior to other methods of farm organization.

An interagency study of farm corporations, between the Internal Revenue Service, Bureau of the Census, and the Economic Research Service, is utilizing information abstracted from income tax returns of farm corporations as a means to identify agriculture census schedules from which national estimates of the number and characteristics of farm corporations will be made. On the basis of the tax returns, present estimates are that there are about 10,000 farm corporations in the United States.

As a result of increased interest in farm incorporation, approximately 25 State and regional meetings were held with lawyers, bankers, farmers, and others seeking general information on the advisability of farm incorporation. A seminar of the North Central Land Tenure Research Committee dealt with several aspects of farm incorporation. Formal papers presented at the seminar will be published as a North Central Regional bulletin.

2. An exploratory study of farm tenure changes needed for resource use adjustment in Iowa has been completed and a manuscript has been submitted for publication in Agricultural Economics Research. This study sought to identify the organization of operating units in a 10-section area that would result in changing from the present to an optimum pattern, taking account of natural features and sizes of units needed to fully occupy the operator under specified conditions. The findings were that the number of operating units would decline from 43 to 20 and that average size of unit would increase from 200 to 320 acres. Man-years of employment would drop from 35 to 20, and 18 sets of farm buildings would no longer be needed in the farm operations. Additional work was done on problems of tenure adjustment by exploring alternative methods of financing ownership, transfer, and farm operation. Data were obtained from Iowa farm records to determine the flow of income that would be available over a period of years for buying the farm under different purchase arrangements. The findings indicate that low equity purchase, without additional assistance, requires a period of repayment that is often longer than an operator's life expectancy. A manuscript of this study is in process. Attention in this

activity is now devoted to analysis of the farm family in the process of change in tenure, and to examining family influence in the financial structure of agriculture.

Progress was made in integrating the three phases of the regional project, "Needed Adjustments in Land Tenure to Meet Changing Agricultural Conditions," which was activated in the period reported. The study is being carried out with the cooperation of the 12 States in the North Central Region and the Division through appropriate contributing projects. Phase A is concerned with projecting future agricultural conditions in terms of future resource needs and organization to meet the demand for agricultural products, and will give attention to the number and kinds of farming opportunities expected to be available. Phase B will be concerned with the relationship between tenure forms and patterns of resource control in selected situations, with emphasis on arrangements that promote economic growth. Phase C will center attention on attitudes and values of individuals that will condition the kinds of adjustments actually made and that will bear upon the optimum adjustments specified in the Phase A studies. Work to date has concentrated on developing procedures for making projections of agricultural conditions and developing questionnaires for studies of the relation of tenure to agricultural adjustment. A field survey on attitudes and values of a sample of Iowa farmers has been completed and the questionnaires are being prepared for analysis.

A study of the effects of landownership on resource development in Northern Wisconsin has been completed and two manuscripts have been submitted for publication. The first, a research bulletin to be published by the University of Wisconsin, is concerned with such questions as how well land is managed, whether it is in its best use, and whether land use could be improved under different ownership. The study indicated that individual owners in the study area are generally more interested in recreation and residential uses of their land than in timber production. Land held primarily for recreation is usually restricted to use by the landowner and his guests or to paying guests of commercial establishments. Land held primarily for forestry is more commonly open to public use such as hunting and fishing. Many of the owners of forested land were interested in the noncommercial aspects of forestry--the scenic and amenity values of forestland--rather than in forest development as a source of income. In general, the study indicated that although the larger ownership units were more likely to engage in some form of multiple use management, on the whole, multiple use management was not widespread. Recreational uses of these lands were often incidental. The second manuscript, which has been submitted for publication as a technical journal paper, is a study of the components of rural land values in the study area. Values of open country land were found to be influenced more by off-site factors, such as adjacency to lakes, roads, and location with respect to population centers, than by on-site factors, such as the kind of improvements, forest cover, or size of unit. In the case of lakeshore property also, the off-site factor, roads, was found to be slightly more important than the on-site factors. Differences between values of lakeshore properties on different lakes were related to differences in quality of both the lake and the property and to proximity to population center.

3. Research is being conducted at the North Carolina Agricultural Experiment Station to determine the effects of certain public programs on the use of agricultural resources in relation to various farm tenure arrangements. Attention is currently being directed to tenure situations existing on flue-cured tobacco farms in each of several time-periods in Virginia and North Carolina. The purpose of this phase of the study is to determine the effects of the tobacco program on the relative returns to land and labor. Most of the data needed for the study have been obtained and the analysis is being made. A paper was presented at the American Farm Economic Association meetings which analyzed some of the effects of the price support programs for peanuts on the sale value of farms.

4. A cooperative research project with the Puerto Rico Agricultural Experiment Station was initiated and will be directed toward examination of the role of land tenure reforms on agricultural development. A paper tracing some of the general historical relationships between the development of Puerto Rican agriculture and industry was presented at the American Farm Economic Association meetings. It is noted that a major contribution of the agricultural sector to general development has been labor; agricultural improvement has generally been slow although production of certain commodities, such as fluid milk, poultry and eggs, and pork, is responding to increased demand.

5. A number of related activities were carried out during the period reported. Although not directly involved with regular research projects, many of these represent a substantial contribution through chairmanship and membership of regional committees and subcommittees, organization of seminars, and work on regional projects. During the period, for example, three chapters were contributed to a Southwest Land Tenure Committee book on a socio-economic approach to problems, programs, and trends in rural land tenure; this is published by the Louisiana State Press. Two papers were presented at the Homestead Centennial; these will be included in a book to be published by the University of Nebraska Press. Four papers presented at the Land Economics Research Symposium appear in a Resources for the Future publication of the proceedings of the symposium printed by the Johns Hopkins Press. Another important related activity included participation in a Department task group on farm credit that considered the present and expected future status of family farms, the special problems of getting established in farming, and the alternative tenure arrangements for acquiring larger quantities of resources, and recommended policies on farm credit.

6. Activities relating to foreign agrarian reform and to review and evaluation of the United States experience in development of land tenure institutions, policies, and programs required considerable time. Several statements were prepared, including a reply to the United Nations questionnaire on Progress in Land Reform, a statement on land tenure for the U. S. Report to FAO, a paper of the Iowa Agricultural Law Center, "Agrarian Planning and Land Reform," and a paper presented at an ICA (now AID) seminar on land reform held in Santiago, Chile. Lectures and seminars for foreign visitors took a substantial amount of time.

Regional committee efforts pertaining to agrarian reform were significant during the period reported. Near the beginning of the period, the World Land Tenure Subcommittee of the North Central Regional Land Tenure Research

Committee set out four activities of which two have been completed. These include preparing a statement on policy for agrarian reform and holding a seminar on agrarian reform and economic growth in developing countries. Formal papers presented at the seminar have been published and distributed by the Division. Interest in the publication is widespread; it has been distributed widely among U. S. and international agencies in addition to the cooperating North Central States, and copies of the publication have been supplied in response to individual requests from many areas.

Other related activities included summarizing relevant census information on farm tenure and size for a statement of the Department's Land and Water Policy Committee.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

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AREA NO. 12. RESOURCE-INCOME RELATIONSHIPS IN DEPRESSED RURAL AREAS

Problem. The use of new production practices and the resulting increase in the commercialization of agriculture has caused some areas to become progressively less able to compete successfully for markets. Farms found in most of these areas have not kept pace with new technology and have not adjusted to the requirements for higher levels of money income. Moreover, surplus labor from depressed rural areas has not been absorbed sufficiently into nonfarm employment. The chief problems faced by people in low-income areas relate to adjustments that may be made in the use of land, capital and labor resources, and to the means by which these resources may be more effectively employed to increase incomes. Analyses are needed of such areas and their farm and family production and income situations to provide information to farmers, to other rural families, and to the Congress and other policy makers for making sound decisions.

USDA PROGRAM

The research in this area is pursued in two broad sub-areas. The first comprises the analysis of characteristics and uses of resources as related to income. Data from censuses of agriculture and population are supplemented by input-output data from selected types of farming areas, capital requirement studies, basic patterns of farm and family incomes, resources available, the nature and use of farm and labor resources of rural areas and other specialized studies. Special studies are being made with State agricultural experiment stations in Arkansas, Florida, Kentucky, Mississippi, New York, Ohio, Oklahoma, and Tennessee. Analysis of these data provide for the entire country, counties, areas and States, information on income by size and type of farm; levels of family income for farm and nonfarm families; and basic pattern of resource use. Trends in amounts of farm resources used and in levels of income are also determined. These data are of particular importance in delineating areas for programming in the Department's Rural Areas Development Program and in determining areas eligible for assistance under the new Area Redevelopment Act.

The appraisal of adjustments in the combination and use of resources comprises the second sub-area of research. In Washington, D. C., work is underway to determine trends in the size of commercial farms and the effect of these changes and related changes in technology upon farm output and efficiency in the use of resources. Shifts in enterprises related to increases in farm size will be determined. From these analyses, the aggregate national change in production and efficiency as related to size change is determined. Work is also underway to determine for low income farm areas the characteristics of farms and farm operators who are operating farms that provide relatively high incomes. This work, which relies on interviews with farmers, also analyzes the method used in accumulating the necessary capital for the farm operation. Cooperative studies with State experiment stations in Kentucky and Virginia attempt to determine for low income areas the effects in agricultural production of the outmovement of labor and the effect in the remaining resources. Cooperative research with the Texas station is

concerned with the evaluation of the broad adjustment opportunities available to farm families in a commercial cotton area. Particular consideration is given to changes in labor and other resource use on farms as a result of shifts of labor out of agriculture, to the opportunities for improving family incomes through nonfarm employment, and to appraise the implications on the agriculture of the area.

There were 18 Federal professional man-years devoted to the area as a whole including 10.2 man-years on the analysis of characteristics and uses of resources as related to income, 6.8 on the appraisal of adjustments in combination and use of resources, and 1.0 on program leadership. A contract with Stanford Research Institute provides for a study to develop analytical methods and procedures for determining the effects of additional public and private investments on income and employment in low-income rural areas.

Studies of adjustment potentials on farms and off farms were discontinued during the year in Oklahoma and Texas.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

The current program of State experiment stations includes an investigation by a Southern State to learn the characteristics of labor drawn into industrial employment; changes in farm organization and resource use where some member of family or operator has taken industrial employment; changes in size of farm, organization, tenure, and resource use on full-time farms in the community, the extent to which expanded industrial demand for labor has affected the supply of labor, and ways farmers have adjusted; changes in the supply of capital available to farmers through local institutions and in demand for capital by farmers; and major problems faced in capitalizing on opportunities and adjusting to the changes brought about by industry. Another Southern State is conducting a study measuring the effects of differential rates of economic growth in the three major areas (Mountain, Piedmont and Coastal Plain) on the market for factors used in agricultural production. A Northeastern State is conducting a study to learn the effect of industrial development in a rural area on employment and income of rural families. A New England station is studying the effects of urban-industrial development policies on agriculture. The study is concentrated on the evaluation of ordinances and the analysis of the advantages and disadvantages of planning and zoning.

The economic impact of highways is being investigated by a North Central State. An attempt is being made to learn changes in uses of land and other resources, costs and benefits resulting therefrom, and the incidences of effects; changes in organization and operation of farms and ranches and costs and benefits resulting therefrom; changes in ownership and value of real estate and incidences of the changes; and the most advantageous uses of land and organizations of farms and ranches.

State experiment stations have 5.3 professional man-years assigned to this research.

Several foundations make studies of factors affecting economic growth. These studies are made by their own personnel or they may provide funds to private universities for making such studies. These few studies are generally national or regional in scope. Several private research companies make resource development studies for local areas. These studies are made for local groups, State development commissions or others for a fee and have covered a relatively small portion of the country. These studies are not confined to depressed rural areas.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Analysis of Characteristics and Uses of Resources as Related to Income

National Trends

In contrast with the increasing rate of numerical decline in total farms, there has been a fairly constant decline in the number of commercial farms. Changes in the rate of decline in all farms have been due largely to changes in the number of part-time farms. These increased in number between 1939 and 1949, but numbered about the same in 1959 as 20 years earlier. Thus while a shift from small commercial to part-time farming characterized the 1939-49 decade, the 1949-59 decade was characterized by decreases in both categories of farms. Growth in farm size (measured by the value of farm products marketed) proceeded at a more rapid pace during 1954-59 than in the preceeding 5 year census periods dating back to 1939. However, the rate of growth is exaggerated in the 1954-59 period because of more complete accounting of the value of farm products sold. Of the 200,000 increase in number of farms marketing $10,000 or more of farm products, for example, it was estimated that at least a third of this increase in number was due to more complete enumeration of farm products sold. Neither the substantial decline in number of commercial farms nor the rapid shift to larger sizes of farms during 1949-59 has served to improve the real net farm income position of the commercial farmers that remain. The level of gross sales of farm products required to yield a given level of real net farm income increased by two-thirds during the decade. On the average, a farm grossing $6,000 in 1949, for example, needed to gross $10,000 in 1959 to realize the same real net income from farming. This is because of the "cost-price squeeze," the trend of increasing purchased inputs, and the decreased purchasing power of a given level of net income.

On the average, and in absolute terms, farm incomes have improved considerably during the past decade. In a changing overall economy characterized by increasing incomes, a generally healthy agricultural sector should, however, at least maintain through time its income position relative to the nonfarm sectors of the economy. Investigations underway suggest that, despite absolute income increases, the farm sector of our economy is failing to maintain its relative income position. For example, in 1947, 43 percent of farm operator families had incomes which placed them among the lowest 20 percent of the nonfarm family income distribution, but in 1960, 59 percent of farm operator families fell in the lowest quintile of the nonfarm family income distribution. At the other end, the percentage of farm families

having incomes that place them in the upper 20 percent of the nonfarm family income distributions declined from 12 percent in 1947 to 6 percent in 1960.

Research directed at determining the fundamental causes of this situation points up the importance of pervasive economic underemployment of labor resources in the farm sector. Estimates at the national level indicate that economic underemployment among farm resident males between 20 and 64 years of age accounts for an equivalent of 1.2 million unemployed persons. This is 25 percent as many as the total number of persons reported unemployed in 1961, using the conventional measures of unemployment.

A study in New Hampshire indicates that, after allowing for differences in labor earning capacity, 60 percent of farm families fail to achieve labor earnings equivalent to those attained by comparable labor in the U. S. economy as a whole. This economic underemployment of family labor resources was found to exist to some degree on all sizes of farms.

The location and persistence of low income rural problems are brought out by investigations which reveal that almost 500 predominately rural counties had median county incomes for all families that were less than half the national all-family median income in both 1949 and 1959.

Investigations designed to evaluate the effectiveness of criteria presently used to designate counties as eligible for assistance under section 5(b) of the Area Redevelopment Act (P. L. 87-27), have revealed that 196 essentially rural counties having county median family incomes of less than half the national family median income are not eligible for assistance by present standards. There are, however, 192 counties with county median family incomes in excess of 75 percent of the national median family income that are now designated as eligible for assistance under section 5(b) criteria.

These studies indicate that, if it is the prime purpose of section 5(b) of Public Law 87-27 to permit eligibility for assistance to counties where the principal dimension of the problem is economic underemployment rather than unemployment, the best eligibility criterion would be all family county median income.

Area Studies

Tennessee. Resources of low-income rural households in East Tennessee have many characteristics that limit their earnings in the present use and restrict their transfer to other uses. People have limited formal schooling and other characteristics associated with advanced age. Capital is primarily in fixed farm assets, and land is in such small and irregular mapping units that recombination into profitable sized units is difficult. Only about 40 percent of the households had resources to make income improving adjustments. The human and capital resource restrictions are due at least in part to selective processes of people adjusting from farm to nonfarm activities. About half of the maturing youth migrate to other areas to accept nonfarm work when their schooling is terminated. Those who leave have considerably more schooling than the ones who remain in the area. Few people over 25 years of age or with less than 12 years of schooling

made adjustments from farming to nonfarm activity or from rural to urban areas. There is much variation in incomes among households in the area. About 33 percent of the variation in earnings was explained by the amount and quality of measured resources and 26 percent (giving a total of 59) was explained by the use made of resources. Labor returned about twice as much in nonfarm activity as in farming, while returns to capital were about the same.

Many kinds of adjustments designed to improve incomes may be made by local people as individuals or as groups. Some of these are meaningful for only a limited number. For example, only a few may improve their incomes by farm adjustments involving improved technology and expansion in size. Programs to improve the employability of maturing youth and increase rates of migration may hasten general economic growth and improve the earning capacity of the individuals who migrate from the area to obtain nonfarm work, but such programs tend to further widen the differences in resource base between those in the area and in the areas where the youth migrate.

Resources available for potential economic growth are greater than those now in the households of the area. Capital can be doubled by borrowing. Labor is being added to the labor force as youth mature at the annual rate of 2 percent of the total population.

Mississippi. Farm earnings and returns per hour employed in farm work were relatively low for part-time farm families in the Clay-Hills area of Mississippi. Overall earnings of this group from both farm and nonfarm work averaged $0.61 per hour, which includes an allowance for farm perquisites. The earnings of these part-time farm operators averaged only $0.17 per hour of farm work but $1.02 per hour of work off-farm. Full-time farmers, on the other hand, earned more than twice as much, $0.40, per hour of farm work, indicating that full-time farmers are more efficient in the use of their labor on the farm than the part-time farmer but less efficient in the overall use of their labor.

Nonfarm open country rural families can be divided into three primary groups according to income source: Off-farm employed, welfare and family supported, and retired. Families in the first group are, on the average, younger, have more formal education, and about 76 percent of them have net family money incomes of over $2,000. The remaining 24 percent are lacking either in education or the presence of an adult male in the family, or are approaching retirement age. These latter families, therefore, can make few adjustments in their work programs that will materially increase their incomes. The other two groups have low incomes (less than $2,000) but, because of the advanced age and low educational levels of these groups, they have only slight adjustment potential for increasing their incomes. These rural nonfarm families do, however, have sizable land holdings which are effectively withdrawn from agriculture. The usual reason given by these families for not renting out their lands is the extremely low cost of ownership under the Mississippi Homestead Tax Exemption Law. Lands rented out cannot be claimed as part of the homestead and are, therefore, subject to taxation at a much higher rate than the exempt property. House renting, on the other hand, is very prevalent among rural nonfarm families.

The number of farms in the area also showed a drastic decline between 1949 and 1959, almost 39 percent. For the most part it was the operators under 45 years of age who quit as farm operators, or those operators who, during the period, moved into the older group and were not replaced by younger operators. While the number of farms and farm operators has declined over a third, the size of the remaining operational units has not increased in the same proportion, even though the average size unit has increased. This seemingly inconsistent relationship results from the large decrease between 1949 and 1959 in the number of farms less than 70 acres in size. The decrease in this group of farms was only 10 percent in number but amounted to 75 percent of the decrease in the total number of farms. The area as a whole has made major adjustments in the overall use of its physical and human resources engaged in agriculture over the last 30 years. However, the rate at which these adjustments was made has been most pronounced during the last ten years.

Much of the study area is in forest which is primarily in private ownership. Farm woodlots account for a sizable amount of the forest area. The average farm family realized little or no return from their farm woodlots even though these lands amounted to 50 percent or more of the average farm. The present phase of the investigation attempts to assess the income potential from farm woodlots.

Oklahoma. For all households (both farm and nonfarm) in a study area in Eastern Oklahoma, about 20 percent of the average family income came from farming, 52 percent from off-farm work and 27 percent from non-work sources. Not only labor resources but also land resources are underemployed in the study area. This is especially true for families depending mainly on farming for their income. Capital tends to be the major restriction to adjustments for more efficient resource use. Labor and land become restrictions only after reduction of their underemployment and/or removal of the capital restriction.

A return of $2,500 required from 823 to 6,248 total acres, depending on the land resource. Native grass and woodland pasture provided almost all of the grazing in the poorest land class, while improved pasture on cropland provided most of the grazing in the better land areas. If this extensive system of farming actually took place with its accompanying increase in farm size, the number of farms in Adair County would be reduced from approximately 1,231 (1959 census) to 213, with a corresponding reduction in labor requirements. Total gross farm sales in the county would be reduced by about a third. Two manuscripts are in process of publication: "Resource Requirements, Costs, and Returns for Selected Crop and Livestock Enterprises, Ozark Plateaus, Northeastern Oklahoma," and "Potential for Agricultural Adjustment and Development in the Ozark Plateau Region of Northern Oklahoma."

Florida. Analysis of survey data from 730 rural families located in 20 counties of North and West Florida indicates that the agriculture of the area faces an adjustment problem arising partly from the trend toward specialized agriculture nationally, the movement of cotton production farther west, and the acreage control programs for the high value crops adapted to the area. Few farms in the area are either large scale or highly

mechanized. Capital values rest mainly in real property with small additions for livestock, machinery and equipment. Employment is limited and incomes are low. The proportion of the survey population in the labor force is well below the national average.

Among the survey population 14 years of age and older, 293 persons, or 15 percent, were still in school. The adjustment opportunities of this group are considered to be of prime importance. Exclusive of the students, more than half of the population (14 years and older) had per capita incomes below $1,500 and were 45 years or more of age. General adjustment groupings based on age, head of household responsibility, marital status, and income level are considered to represent problem situations differing sufficiently to make desirable the formulation of programs of adjustment aid tailored to the needs of the particular group.

The high per capita incomes reported in the group of urban counties, compared to the other groups of more rural counties, suggest the importance of urban centers in program planning and operation. Development areas should be delineated with due reference to Gainesville, Tallahassee, Pensacola, and Jacksonville as centers of trade, job opportunities, education, and leadership.

The low levels of schooling revealed in this study suggest the need for more training, education, career exploration, and aptitude testing.

The interest in farm enlargement displayed by the younger and more commercial farmers suggests that lenders of capital might give special attention to the needs of this group who have the desire to enlarge their operations and expand production based on their current dollar equities. The credit needs of farmers with adjustment potentials in commercial agriculture differ from those of farmers who likely cannot attain larger scale operations but who can adopt better practices and techniques.

The presence of small farms, idle cropland, and the desire of some operators to expand production suggests group action to promote farm enlargement.

This study suggests the need for: More and better education, testing, and vocational guidance, especially for the youth of the area; credit, farm enlargement, and land consolidation assistance for farmers with a potential to increase profitable production; credit and management supervision for farmers who cannot attain large scale operation; and justifiable expansions in coverage of social security, welfare and other transfer programs for the low-income groups who are unable to make other adjustments. A manuscript, "Income, Resources and Adjustment Potentials Among Rural Families in North and West Florida," is in process of publication.

Missouri. A study of the process of accumulating sufficient farm resources in a low income area of the Missouri Ozarks to provide a minimum gross farm income of $10,000 showed that an average of 500 acres of land would be required. Very few of these farm operators do any off-farm work. Most of the operators were born and raised in the area and received a substantial part of their property through inheritance. In many cases there was a

property sale with terms more favorable to the present owner than they would have been if the property had been sold to an unrelated buyer. Nearly all the operators with $10,000 or more of sales had definite plans to increase the size of their operation either by purchase of more land or intensifying their operations.

B. Appraisal of Adjustments in the Combination and Use of Resources

Kentucky. Low incomes in a study area in South Central Kentucky are not peculiar to agriculture. Households with farm operators as heads appear to have somewhat higher incomes from all sources than do most other major activity groups.

By tenure among farmers, minor part-owners (owning less than half the land they farmed) worked the most days and had the highest average income (approximately $3,000 earned by the head of household). Tobacco-corn croppers and tenants worked the fewest days and had the lowest average income (approximately $1,500 earned by the household head). Less than $10,000 in farm capital used corresponds closely with less than $2,000 in net farm income.

Of 427 households on census definition farms, 191 had less than $2,000 income from all sources. Of these, 191 there were 41 with household heads aged 65 or older and 7 with female heads, leaving 143 with able-bodied male heads under 65. Of these 143, there were 65 heads of households with less than a fifth grade education, leaving 78 (or 41 percent of the 191) who might be able physically and mentally to do reasonably well in place. Of these 78, there were 44 heads aged 45 or older, leaving 34 (or 18 percent of 191) who might be adaptable to moving into other employment. Of 172 nonfarm households, 112 had less than $2,000 income from all sources. Of these 112, there were 44 with heads age 65 or older, 17 with heads disabled or retired, and 14 with female heads, leaving 37 (or 33 percent) with able-bodied male heads under 65. Of these 37, there were 13 heads with less than a fifth grade education and 9 with heads aged 45 or older, leaving only 15 (or 13 percent of 112) most likely to be adaptable to new employment.

Parts of the area have fairly good agricultural resources, but there are too many people dependent on them. Some people must find other employment. Others may need to be helped to enlarge and reorganize farms. Nonfarm employment opportunities in the area were few and weak. Apparently, most nonfarm employment will have to be found outside the area.

Probably the most basic problem in the study area is the very low educational level, and this might well be the focus of long-run improvement.

Virginia. A study in central Virginia reveals that there have been significant changes in the way in which the title to land is held. For example, in 1930 relatively few ownership units were owned by husband and wife but in 1957 more than a third of the units were owned by husband and wife, normally with right of survivorship. Additional work elsewhere indicated that this change is common in many areas. The fact that much property is now owned by husband and wife with right of survivorship, and that the

wife normally has a longer life expectancy than the husband, suggests the need for both husband and wife to have a will since in many cases it will be the surviving widow who determines the disposition of the property. The part-time farms and the rural resident farms were operated largely by people who obtained a job in a plant and then acquired the land in the country as their home. The movement was predominantly from an urban area to the rural area and not from the farm to nonfarm employment.

In this area (with a relatively low rate of tenancy) there is a very large movement of land from one ownership unit to another. For example, the amount of land in units from 50 to 140 acres was about the same in 1957 as it was in 1930 but the 1957 acreage included only a third of the identical land that was also in the 1930 acreage. Two-thirds of the land that was in this size unit in 1930 moved into other units by 1957 and was replaced by almost the identical acreage. This movement of land from one unit to another is concealed when only the aggregates are examined.

In examining the changes in size of ownership units a definite cycle appeared. The cycle, at least for the past, can be described as one where the beginning farmer starts with a small unit and over a period of time builds his unit up into a fairly large enterprise. At his retirement or at his death this unit is frequently broken up into a number of smaller tracts, some of which become smaller farm units while others are added to an already existing unit.

Texas. A study of adjustment opportunities of farm people in Texas shows that a principal adjustment of low income people has been to part-time farming. Primary income was from off-farm activities with a very low level of efficiency in the farm operation. Usually, net money returns from part-time farming were low or a net loss. Hourly returns in off-farm work approximated $1.40 as against total returns of $0.39 per hour for family labor and management in the farming enterprise.

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AREA NO. 13. EVALUATION OF RURAL DEVELOPMENT PROCESSES AND PROGRAMS

Problem. Many rural areas have an economy that is not expanding along with national growth nor as rapidly as increases in population; in many cases the economy may even be shrinking. As a result, incomes of the people are declining in relation to national levels. Little is known of the forces and influences that cause the economy of one rural area to adjust more rapidly than another to changing economic and social conditions. There is need for basic information on the forces affecting economic growth in such rural areas where growth and expansion are lagging. It is necessary also to evaluate public programs and other measures intended to stimulate economic development, and to assist local and area efforts in economic development through research information bearing on the problem.

USDA PROGRAM

Much of the research in this area is basic research concerned with understanding the influences and processes determining economic development in rural areas and the relation of local economic growth to regional and national economic growth. Also work is underway to analyze the effects of programs at various levels of government in stimulating economic growth.

In Washington, D. C. the work encompasses the outlining of theoretical models for development and testing through use primarily of secondary sources of data in determining the factors affecting growth and the interrelationships among regions and national growth rates.

Local studies are conducted in cooperation with State experiment stations on different areas of the economic development process. In Michigan a determination is being made of the factors affecting the ability of farm people to compete for nonfarm jobs and the effect of different rates of economic growth on the ability to obtain nonfarm jobs. In Oregon and Missouri the various factors influencing the future development of an area are being studied. In Pennsylvania a study of the impact of a large industry on the local economy is underway. In North Carolina a study is being conducted primarily to identify and evaluate relationships between agricultural and national economic development patterns, and to indicate probable effects of different rates of national economic growth upon resource and income conditions in selected types of low income areas. In Ohio a study has been started to appraise the opportunities for outdoor recreation enterprises on farms. In Indiana a study is being planned to determine the place of training and education as a means of providing more job opportunities for workers in low income areas.

At present 12 Federal professional man-years are devoted to this area of research including 4.5 man-years devoted to economic development processes in depressed rural areas, 3.0 man-years to the relation of local economic growth to regional and national economic growth, 3.5 man-years to evaluation of proposed programs in depressed rural areas, and 1.0 man-years to program leadership. This area of work is relatively new and there have been no terminations of lines of work.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

Thirteen projects are being conducted in three regions. In the Southern region, work consists of an appraisal of agricultural adjustment opportunities associated with the creation of opportunities for off-farm employment; an analysis of forces and conditions that cause low-farm income in delineated depressed rural areas; and the formulation and evaluation of alternative means for promoting economic development. In the North Central region, work is concerned with an appraisal of part-time farming as an intermediate step in the transfer of labor resources out of agriculture; an analysis of the low-income situation in a specified county and the evaluation of the decision-making process of a quasi-public group regarding the improvement of economic and social conditions; and an analysis of adjustment response patterns developing in agriculture from industrialization, economic growth and other changes in the nonfarm economy. In the Western region, research related to resource-income relationships in depressed rural areas entails an economic analysis of minimum size farms providing an adequate living for Indian families; an appraisal of socio-economic resources and problems in the farm and nonfarm economy in a delineated low income area; and an investigation of on-farm production adjustment opportunities for improving farm income.

The Federal Reserve banks and large commercial banks make analyses periodically of factors affecting economic growth. These analyses customarily pertain to the total national economy and to broad regional areas served by the particular bank that makes the analysis. Some large corporations such as utilities and transportation companies make economic analyses of area development potentials for their internal use and for business promotion. These corporation analyses are generally for specific segments of the economy and are often not available to the public.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Economic Development Processes in Depressed Rural Areas

From the study of economic development processes there is increasing evidence that the Nation's rural low income problem represents, in large part, an involuntary underemployment problem, the solution to which is closely related to solutions to the general problem of involuntary unemployment. As indicated earlier, there appears to be underemployment on the basis of income to the extent of 1.2 million man-equivalents of unemployment in U. S. agriculture in 1959. Supply-oriented labor market imperfections appear to be much overemphasized relative to the demand-oriented imperfections and insufficiencies. Solutions of the rural low-income problem which are geared to national employment policies are more likely to achieve a solution to the agricultural low income problem than reliance upon earlier existing programs.

A case study of a low income area focussing upon a successful community development effort, found a number of considerations to be of vital importance for such a program: (1) Close cooperation between town and rural people in the immediate area, (2) enlightened concern for the local conditions and the primary dependence upon local effort, and (3) strong and widespread local support, including large contributions of personal time and funds. Not least important was the publicity given to the program by the local press. In the process of the development of the area, adjacent local areas continued to lose population, a portion of it presumably to the immediate area. This development was found to give evidence of the nodality of industrial development. In terms of the bounds of the county in which the city is located, especially when measured in terms of family income improvement, the local community must be regarded as a success.

In the study of units for economic development, geographical precedents were found to encourage the formation of developmental units which would encompass several counties rather than a single county. The importance of macro-variables was emphasized in explaining existing geographic differences in labor factor rewards to labor of equivalent skill. In particular, the need was found for an economic model which would deal adequately with local labor factor rewards in a situation of less than full employment, coupled with downward inflexibility of wage rates. The outline of a model was proposed which would consider the process of geographic and farm-nonfarm income differences in an economy experiencing progressively fuller levels of employment.

The role of development commissions upon economic growth found the role of disinvestment of resources, particularly those in the form of public assets, as roads, public buildings, schools, etc. to be relevant and important to the growth process. Regional disparities in labor incomes can be corrected by utilizing the labor in place, by moving it to another place, or, of course, some combination of the two. Impediments were found to an out-of-place solution not only at the point of origin, but also at the destination. In effect, there is only limited freedom of entry, especially in times of less than full employment, for migrants from rural low income areas to areas of higher income. In such a context, an important role was found for the local development commission. In general, such organizations can take action to improve the general level of knowledge relating to the local communities' human and other resources. Two important negative aspects were found in the role of development commissions: Their very large number (in excess of 14,000), and the use in some cases of a "display advertising" type of promotion as contrasted with promotional activities resting more directly upon the provision of knowledge and services directly relevant from the economic point of view.

An analysis of the Manpower Development and Training Act found that the Act introduced for the first time in legal usage an expression of the economic concept of underemployment (as defined for example, by the International Labor Organization) in terms of unemployment. Another important precedent in the Act exists in the use of an income criterion to identify underemployment. It provides that farm families for purposes of the Act may be classed

as unemployed if the annual income is not more than $1,200. Although this procedure would represent only the most conservative estimate of underemployment in the rural areas of America, the recognition of the importance of the precedent is vital. Utilizing the $1,200 criterion, the number of unemployed families engaged in agriculture in 1959 exceeded 700,000. For the year 1961, this would represent an increase of 15 percent above the conventional amount of unemployment of 4,806,000 in that year. In other years in which conventional unemployment was recorded as less, the national percentage increase was even greater. The use of the new criterion would have special significance for particular States, especially those which have a large portion of their labor force in agriculture. For example, for 1961 South Dakota showed an increase of 251 percent over the conventional amount of unemployment. According to these estimates, the Act could provide considerably more funds to more rural States with the new provision.

An analysis of a sample of Michigan farms revealed that part-time farm families experienced about the same financial progress, 1953 to 1958, as full-time farmers of comparable beginning net worth. A majority of the part-time farmers consider their dual income earning role as a permanent means of making a living, rather than a transitory step into or out of agriculture. Furthermore, the importance of part-time farming to Michigan agriculture is illustrated by the estimate that they produce about a fifth of the value of farm products sold by Michigan farmers. Partial analysis of data gathered on the employment practices of the largest industrial firms in two Michigan cities indicates that employers do not differentiate nor discriminate against part-time farmers as a source of labor supply. Of major importance to the employer is the employee's attitude and his willingness to work full-time at the nonfarm job. In a reconnaissance study of two adjacent labor markets experiencing a substantial and persistent difference in unemployment rates, a combination of factors was found to account for the differential: Differing industrial structure; an historical difference in attitude toward industry on the part of community leaders; and differences arising from the manner in which statistical labor force data are compiled.

The plans for the study of the impact of an industrial plant on the economy of a depressed rural area in Pennsylvania have been modified because of the almost complete shutdown of the plant. However, the following are some general findings. Total employment at the plant was zero in 1954, around 1,000 in 1958-59, close to 200 in 1961, and probably under 100 by June 1962. The peak employment of 1,000 in 1958 was rather evenly divided between professional personnel in research and production workers in manufacturing activities. The professional personnel usually took up residence either at a housing development in the countryside around eight miles from the plant, or in communities of 5,000 population and over located 25-50 miles from the plant. Their trade and real-estate market impact was confined mainly to the larger trade centers distant from the plant rather than to the small communities close by. Production and other skilled and unskilled workers were recruited both from communities close to the plant and from places 30 to 50 miles distant.

The main impact of the plant on local tax receipts and expenditures was felt primarily in only two townships. One contained the plant itself. It gained a large increase in property base that was not offset by a significant increase in demand for local government services, since few families took up residence in this township. The other township had the housing development of professional personnel. This development increased the tax base but also created a demand for a new school which increased tax expenditures considerably. The subsequent cutback of operations at the plant and accompanying depopulation of the area created a community of vacant dwellings and a school financing problem for the residents that remained.

In this instance of a new industrial plant locating in a rural area, it appears that the larger communities were able to benefit to a greater extent in trade and real estate investment than the small centers. The establishment and subsequent abandonment of a housing development in the countryside near the plant but distant from any large population center, illustrates the hazards of a "depressed" rural area becoming dependent on one big new industry. It was evident from the differential employment adjustment records of professional and non-professional employees that the former had considerably more opportunity to secure new positions than the latter. Some of the released non-professionals were still without work long after being discharged, indicating a lack of locally available job openings and maybe of suitable positions elsewhere.

B. Relation of Local Economic Growth to Regional and National Economic Growth

Data for the 13 Southern States are being analyzed to determine the number of farm operators, and their location, most likely to be helped by development programs. Of the total of 1.6 million farm operators in these States, 639 were considered as potentials. Between 70 and 105 thousand of the potentials were estimated to be recruitable for high skill (high wage) employment based upon age, farm income and training. From 255 to 350 thousand were estimated as recruitable for both medium and high skill employment. These estimates indicate that half of the potentials could qualify, at most, for low skill or low wage employment. Areas with the heaviest concentrations of potentials (found in North Carolina, Tennessee and Kentucky) are not eligible for assistance under the ARA program.

C. Evaluation of Proposed Programs in Depressed Rural Areas

A study of tourism in a 31 county area of the Missouri Ozarks indicated that the total volume of business done by retail and personal service firms in this area was $319,500,000 in 1959. The operators indicated $68,000,000 of this amount, or 21 percent, was obtained from tourists (non-residents of the area). The $68,000,000 was about 75 percent as large as the total value of sales of all farm products in the area in 1959. Eighty-seven percent of the operators of retail and personal service firms were born in Missouri; 63 percent of them were born in the Ozark area. Over 72 percent of the operators were reared on farms or had operated a farm. Seventy-nine percent of the operators stated that they had not been employed outside the state of Missouri, and 52 percent had not been employed outside the county in which they were currently residing.

There were 17,519 workers employed by the operators of retail and personal service firms in the area in 1959 and they were paid $27,435,000. In 1959, as a result of the tourist trade, 5,321 persons were employed either part-time or full-time and they were paid $6,119,000 in wages. About 97 percent of these people lived in the county where they were working and lived there prior to their present employment. This was the only employment for about 82 percent of them. Half were women. About 41 percent of the employees lived in rural areas prior to their present employment. There was no significant difference between the relative number of rural and town workers who were hired for semi-skilled and managerial positions. More than 60 percent of the jobs provided by the tourist trade required little formal education.

Even though the population of the Ozark area has decreased about 25,000 since 1950, the number of retail and personal service firms has increased about 32 percent. It is estimated that the tourist trade contributed $26,071,000 in 1948 and $68,000,000 in 1959, and at the current rate of development will contribute $124,898,000 to the economy of the area by 1970.

Most of the patrons who stayed at motels in the various recreation areas in the Missouri Ozark region in 1960 were from Missouri but not from the Ozarks. More than 88 percent of them lived outside the Ozark counties. About 80 percent of them visiting the Lake of the Ozarks, White River, and Big Springs areas were less than 300 miles from home, whereas about 55 percent of those stopping in the Central Ozarks were less than 300 miles from home. Almost 65 percent of the guests who stayed at motels were in parties of two or less persons, and they usually stayed only one night. More than 50 percent of them came from non-metropolitan areas.

A study of part-time residents in Taney County, Missouri, revealed that nearly 16 percent of the residential property in Taney County, located in the Ozarks, is owned by families who reside there part of the year in homes on man-made lakes that have been created recently in the area. The addition of these residents to the local economy has had a stimulating effect upon it. The average income of these part-time residents was about $9,040 a year. In 1960, they spent about $340,000 for consumable items while residing in the county and $250,000 for the construction of their new homes. In addition to the residential property constructed, it is estimated that $3,659,080 worth of business properties were constructed to cater to their needs. During that year they paid about $10,876 in local property taxes while the business required to service their needs paid another $18,756. About two-thirds of these taxes were used to finance local schools. None of the part-time residents had children in school. If the present rate of development continues in Taney County to 1975, the part-time resident will be spending annually $2,297,000 for living expenses, $73,548 in local taxes, and more than $5,000,000 for the construction of new homes.

Projections of tourist visitation and the employment and income effects of the proposed national recreation area on the Buffalo River in Arkansas indicate that five years after establishment, about 3.4 million visits would be made to the area annually and would contribute about 3.8 million dollars annually to the area economy. Direct contribution of recreation-area visitors to area income would be approximately equivalent to 108 industrial plants of the size and type currently operating in the area, or to that of 34 plants equivalent to the State average. Secondary effects of recreation expenditures accrue at an estimated rate of about two-thirds of the direct effects, and might increase total income effects of recreation in the area to more than 6 million dollars annually. New businesses accompanying the establishment of the area would provide about 1,700 new jobs.

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AREA NO. 14. ECONOMICS OF FARM PRACTICES AND TECHNOLOGY

Problem. New and rapidly changing technology is having profound effects on agriculture. Ever-changing conditions of production brought about by new machines, new-type structures and related equipment, and improved methods of crop and livestock production require continual economic study to provide farmers, policy makers, and industries serving agriculture the guidelines for decision in a changing economic environment. Such studies must measure and keep abreast of major changes in farming technology and must appraise the implications of these changes for the future. These studies should include analyses to provide information needed by farmers in different situations as they adjust to changing conditions of technology, prices, and costs. They should also include analyses aimed at guiding policy makers and program administrators as well as at helping industry to meet better the needs of farmers.

USDA PROGRAM

This is primarily applied research, consisting of a continuing program of collection and analysis of data bearing on national situations and of the study of certain important innovations in farm practices and technology. Included are the development of aggregative measures of the effects of technological changes on farm output, costs and incomes.

More specifically, the work involves the collection of pertinent data and the economic analysis of developments in farm mechanization and structures, in the use and effects of fertilizer and related crop practices, and in the production and utilization of livestock feed. These activities center in Washington, D. C. and consist mainly of broad national studies dealing with both the supply aspects and the demand aspects. They usually involve at least informal cooperation with other USDA agencies, particularly the Statistical Reporting Service and the natural science groups dealing with mechanization, crop practices, and livestock feeding. The research results are normally presented in aggregative terms for areas, States, or regions, along with supporting data such as input-output ratios. Intensive studies of narrower scope are made occasionally in selected areas to obtain information to supplement national and regional data from other sources. Such studies are usually in cooperation with State experiment stations.

At the beginning of fiscal year 1962, a total of 13.6 Federal professional man-years was devoted to this program, distributed as follows: Economics of farm mechanization and associated techniques, 3.9 man-years; economics of farm structures and materials handling, 1.1 man-years; appraisal of fertilizer use and cropping systems, 3.1 man-years; economics of feed use and feed-livestock relationships, 2.6 man-years; inventory of production practices, 1.9 man-years; and economics of cotton insects control, 1.0 man-years. However, during the fiscal year certain research projects and field personnel were transferred from Area No. 14 to Area No. 1. As a consequence, Federal professional man-years in Area 14 currently total 9.6 distributed as follows: Economics of farm

mechanization and associated techniques, 1.9 man-years; economics of farm structures and materials handling, 1.1 man-years; appraisal of fertilizer use and cropping systems, 2.1 man-years; economics of feed use and feed-livestock relationships, 2.6 man-years; and inventory of production practices; 1.9 man-years.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

Several of the State experiment stations are also working in the area, with a current annual input of about 21 professional man-years. This work as a whole covers the same sub-areas as the USDA program but each State tends to center its efforts on aspects of particular local importance. A sizable proportion of this work is in connection with regional research projects.

Industry also does considerable research in this area, aimed primarily at appraising market opportunities and used mainly for guiding internal management decisions. Most of this can be characterized as "operating research" but some of it--perhaps as much as 35 to 40 professional man-years annually--is of sufficient scope to be comparable to that of the USDA and State experiment stations.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Economics of Farm Mechanization and Associated Techniques

The numbers of major machines on farms are estimated annually, and the results have shown generally increasing numbers for several decades. The rate of increase has varied somewhat for different machines and for different years but the pattern has been a general and rather substantial increase year after year, with some slowing down in recent years. The data now available indicate that some important machines, such as wheel tractors and grain combines, reached peaks in 1959 and 1961, respectively, so far as numbers on farms are concerned. Other machines, such as pickup hay balers and field forage harvesters, are still increasing materially in numbers. Furthermore, it is likely that increases in size and capacity have been sufficient to more than offset any tendency for the number of machines to level off or decline. Final results from the 1959 Census show that milking machines declined substantially in numbers during 1954 to 1959. Here again, however, quality and efficiency found in increasing numbers of herringbone systems and other milking parlors are offsetting factors.

Other trends of interest concern the horsepower and the type of fuel used in wheel tractors manufactured over the past decade. Average horsepower (maximum belt) increased from 29 in 1950 to 52 in 1961. From 1950 to 1961 the percentage of new wheel tractors designed for gasoline fuel declined from more than 90 to 49, offset by increases in those designed for diesel fuel and liquefied petroleum gas. However, beginning with production in January 1962, there was a halt in the trend toward diesel-type tractors, and by June, 58 percent of the units produced were designed for gasoline. During the first 6 months of 1962, gasoline-type wheel tractors represented 54 percent of the total production and diesel-type 42 percent. This compares with 49 and 47 percent, respectively, in 1961.

It may be too early to assume that a reversal in the diesel trend has occurred. Inventories of wheel tractors do not disclose the numbers by fuel type, and an adjustment in inventory ratios is possible.

Research has been started on the aggregate demand for farm machinery. At present, this work is limited to farm tractors for different regions and for the nation as a whole. Various economic models are being considered for their effectiveness in explaining the past and their ability to forecast future changes.

Investigations of the economics of mechanized tree-fruit harvesting continued on a reconnaissance basis in 1962. Possibly 60 or more mechanical harvesters were used on cherries in the eastern United States this year, compared to about 50 in 1961. Research to date suggests that producers with 20 acres or more of bearing cherry trees and average production per acre may afford to mechanize the harvesting operation.

Observations of "wafering," a new method of putting up hay, were made in 1962. This method uses a machine which gathers the hay from a windrow, compresses it to a 2" x 2" by 4" wafer of about twice the density of baled hay, and extrudes these wafers onto an elevator which carries the material into a trailing wagon. Observations indicate that alfalfa hay can be wafered at the rate of 2.5 to 3 tons per hour as compared to field baling operations of 5 to 6 tons per hour. Preliminary results suggest that wafering, despite a lower harvesting rate may, in some circumstances, have advantages over baling, particularly when comparing a fully mechanized "system" of harvesting and feeding. The combination of a wafering machine, flail forage harvester, and windrow turner requires an investment of about $10,000, compared to about $6,000 for a baler with a bale-thrower plus a mower and rake.

B. Economics of Farm Structures and Materials Handling

No progress to report.

C. Appraisal of Fertilizer Use and Cropping Systems

Aggregate estimates from pilot studies in selected areas and for types of farms of the Georgia Piedmont area and Missouri, under specified assumptions as to the level of technology on farms, provide projections showing a very marked decrease in acreage of land farmed.

One set of projections for a part of the Georgia Piedmont is based on normative solutions for crop-beef farms for different operator income levels. These solutions are related to 1980 projections of numbers of farms by income classes that indicate 35 percent fewer commercial farms, but an increase of 50 percent of those with gross rates of over $10,000. The price assumptions used in the study were those which have been provided for long-time-projections work of the Department. Under these assumptions there would be a reduction from 1959 to 70 percent in the acreage of land in farms and 55 percent in the aggregate capital investment. Aggregate net farm income would be down about 9 percent in this area, but income per farm would be up about

40 percent compared with estimates for 1959. This projection assumes a level of technology currently in use by leading farmers except that fertilizer use would be optimum for limited capital situations.

Marked shifts would occur in the input composition. Aggregate expenditures for fertilizer would increase four-fold. Expenditures for feed and for hired labor for crop-beef farms would be negligible compared with 1959 outlays for all commercial farms in the area. However, outlays for purchases of livestock would be nearly 3 times as great. These illustrative results compare projections for crop-beef farms with the average of all commercial farms as organized and operated in 1959.

The effects of changes in technology on the organization of resources at the micro level can be shown with an example in the Putnam-Lindley area of Missouri. The results of the study show that for medium to large farms the operator's income can be maintained with fewer resources, providing either improved technology or larger quantities of fertilizer, or both are used. With limited capital and by using fertilizer in optimum quantities, improved crop technology would reduce the land base requirement by about 35 percent and total capital investment by nearly 25 percent. By using present technology and increasing fertilizer from the level used in 1959 to the level optimum for limited capital, the farm acreage requirement would be decreased by 40 percent (5 percent more than the 35 percent indicated above) and the total capital investment requirement would be decreased by 33 percent. Also other input substitution relationships are made apparent.

D. Economics of Feed Use and Feed-Livestock Relationships

Research is carried on at the national level to determine the effects on feeding efficiency of new technology in livestock feeding and management. The data have been revised and updated through the 1961-62 feed year. They show that in recent years very high feeding rates on farms for hogs and possibly beef cattle would need to prevail for currently estimated livestock numbers to consume the concentrates estimated to disappear annually. This is noted even though greatly increased amounts of concentrates were allocated to dairy cows. Feed balances by States were prepared in connection with Civil Defense to determine possible areas that might encounter severe feed shortages. The balances included the 1960 and 1961 feed years. These balances indicated that sufficient feed grains were stored within each of the States to meet emergency minimum needs in the event of enemy attack with only a few exceptions, such as California, the New England States, and Florida. Even here the extent of feed shortages seemed minor with respect to other problems.

The feed consumption records for cooperators in Illinois from 1939 to 1959 on over 3,000 droves of feeder cattle showed that over that period the amount of concentrates fed per 100 pounds of gain declined from 20 to 30 percent. The heavier cattle--those weighing 850 pounds or more when put on feed--required nearly 1,200 pounds of concentrates per 100 pounds of gain. For light cattle--those weighing 450 to 600 pounds--only about 600 pounds of concentrates were required per 100 pounds of gain.

A study of changes in livestock production and productivity with projected changes to 1975 has been conducted in cooperation with technical specialists. An improvement in feed efficiency of 12 to 15 percent is projected as economically attainable by 1975. The maximum economically attainable for the same period--1953-55 to 1975--is 20 to 25 percent. These improvements would have other results not yet fully analyzed. A manuscript is being reviewed and revised for publication.

The field work for a study of the competitive position of alternative methods of processing feeds on dairy, livestock and poultry farms was completed and two reports written and published. Whether a farmer would utilize the service of a custom stationary or mobile mill depends partly on the value of the farmer's labor and partly on the amount to be processed at one time. The former depends upon alternative opportunities for the use of farm labor and the latter on the size of the particular livestock enterprise.

The grains would have to be hauled to the stationary mill, while the mobile mill would be brought to the farm for the feed grinding and mixing. A table showing the cash costs and labor requirements per ton was presented and least-cost zones were shown in a chart.

An individual farmer could determine the most economical method for him by comparing the cash and labor costs of the two methods--valuing his own labor at what it would earn at other farmwork or at off-farmwork, whichever was relevant.

A study of the economic aspects of specific pathogen free hog production showed that farmers who were having disease problems with two very prevalent virus diseases could profitably utilize SPF methods in establishing a clean drove of hogs. However, if their hogs were comparatively free of the two virus diseases, there would be little economic advantage with SPF pigs. A manuscript is ready for review.

A study of contract hog production in Tennessee brought out the fact that integration was proceeding very slowly with swine. Only 10 farms were found in Tennessee having contracts. Management practices employed were very similar to those of independent producers of comparable size. However, small farmers can increase their volume of production sharply and quickly with the assistance of the capital inputs provided by integrators, such as feed dealers, who can expand their outlets for feed and have a tighter control over these outlets. A manuscript is being edited.

E. Inventory of Production Practices

A national survey and analysis of spraying and dusting on farms was completed. It shows that in 1958 more than 92 million acres of crops and other farm land were treated one or more times for the control of insects, diseases, weeds, and brush. In 1952, a similar survey indicated treatment on 60 million acres. In addition to pest control, the 1958 study shows treatment on 3.7 million acres to defoliate crops--chiefly cotton.

To control insects and diseases, farmers treated 37 million acres an average of 2.6 times in 1958. This compares with 29 million acres treated an average

of 2.9 times in 1952. Cotton, still the leading crop in acreage treated, accounted for more than 8 million acres of the total. By crops the greatest increase from 1952 to 1958 was on corn. The 4.5 million acres treated in 1958 were more than 10 times those of 1952.

Weed control accounted for 75 percent of the increase in total acreage treated between 1952 and 1958. Applications on the corn crop, increasing from 9 million acres to 21.6 million, were largely responsible for the overall increase.

Ground equipment was used for 78 percent of the total spraying and dusting in 1958. The remaining 22 percent was done with aircraft, largely by custom operators. Application by aircraft ranged from less than 3 percent of the total acreage in the Corn Belt to around 45 percent in the Mountain States. Farmers used their own equipment to treat 68 percent of the acreage. Another 5 percent was done with borrowed, rented, or exchange equipment. Custom operators, of course, accounted for the remaining 27 percent.

Preliminary results from the national survey on farm consumption of liquid petroleum fuels in 1959 show only a moderate increase of 4 to 5 percent in the amount of fuel used in tractors since 1953. The big change is in the consumption of diesel fuel and LP gas. In 1953, about 10 percent of the 3,271 million gallons of tractor fuel was represented by these low-cost fuels. By 1959, consumption of these fuels had more than doubled.

Tractor hours of use distributed by months show May and June to be the months of heaviest use. December, January, and February are months of relatively light use, accounting for about 10 percent of the annual total.

Interim estimates were made of methods of harvesting hay and silage crops in 1959, using previous survey data on methods along with recent changes in machine numbers. These estimates show continued increases in hay baled and in silage harvested with field forage harvesters. In 1959, around 82 percent of the hay was baled, 11 percent harvested as long, loose hay, and 7 percent was chopped. Around 90 percent of the corn silage and nearly all of the sorghum silage was harvested with field forage harvesters.

Interim estimates on the extent of methods used to harvest small grains, soybeans, sorghum for grain, and peanuts in 1959 were developed in the same way as those for harvesting hay and silage and show that combining, either as standing grain or from the windrow, accounts for nearly all of the harvesting. Between 1/2 and 3/4 of the wheat is combined from the windrow in Minnesota, North Dakota, and South Dakota. Combining from the windrow is relatively unimportant in most of the remainder of the country. Estimates for the peanut crop show that 80 to 95 percent are now combined except in the Appalachian States. Fancy peanuts coming from Virginia are still threshed.

Work continued on summarizing national information on methods of harvesting small grains and corn for grain in 1960. Preliminary results on harvesting corn show little change in the percentage of the crop harvested with mechanized pickers since 1956. However, the percentage of the acreage harvested with picker shellers increased from 3 to 12 percent in this period. Custom operators accounted for about 1/3 of the field shelling in 1960.

Preliminary data on the average size of combine crews range from about 1.8 in the Corn Belt States to about 2.3 in the Appalachian and Southeast.

Estimates of the use by individual crops of the principal plant nutrients have been completed for 49 States and Puerto Rico. The estimates were based on the 1959 Census of Agriculture. The inventory shows a marked increase in fertilizer use, especially in the irrigated areas. A considerable part of the increase in fertilizer use has been on feed grains.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Economics of Farm Mechanization and Associated Techniques

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B. Economics of Farm Structures and Materials Handling

None

C. Appraisal of Fertilizer Use and Cropping Systems

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D. Economics of Feed Use and Feed-Livestock Relationships

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E. Inventory of Production Practices

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AREA NO. 15. FARM COSTS AND RETURNS

Problem. In this period of current and prospective rapid changes in agriculture, it is very important to have available comprehensive and reliable data over time on farm operations, production, costs and returns for various types and sizes of farms. Such data and analyses based on them are essential for intelligent policy and operating decisions by the agencies and industries serving agriculture, and by farmers themselves.

USDA PROGRAM

The work on costs and returns by major types of farms is a continuing study of operations of typical or representative commercial farms to determine changes in size of farm, organization, productivity, receipts, expenses, net farm income, physical inputs, farm output, prices received for products sold, and prices paid for goods and services used in production. Budgets are prepared annually to provide current information. Estimates for earlier years are revised as new information becomes available. Analyses are continually underway to show the effects of economic and technical changes on land, labor, and capital requirements, production, production efficiency and incomes of commercial farms. Nearly all the work is done in Washington with informal cooperation with States where the studies are located. Formal cooperation exists with Kentucky.

Work on cost of production of farm commodities was a continuing study of changes in production costs. Field surveys were made periodically to obtain basic data from farmers. The data were summarized and analyzed to show costs of production of major farm commodities by areas and by types and sizes of farms, changes in costs and efficiency as affected by technology and cost rates, and effect of changes in costs on use of farm resources and output of specific commodities. Nearly all the work was done in Washington with informal cooperation with the States where the studies were located. This project as a separate line of work was discontinued in July 1962.

A total of 15 Federal professional man-years were devoted to all costs and returns work, with 11 devoted to costs and returns by major types of farms and 4 to costs of production of farm commodities.

RELATED PROGRAMS OF STATE EXPERIMENT STATIONS AND INDUSTRY

Thirty-eight State station projects are underway on costs and returns by major types of farming. The projects deal with the relative profitableness of farming in relation to location, size of operation, enterprise combination and organizational arrangement. Major lines of production investigated include dairy, poultry, beef cattle, hogs, corn, wheat, rice, cotton, vegetables, fruit, forage and timber.

Twenty-eight station projects related to costs of production of farm commodities are underway. Studies of costs of producing farm commodities include field crops, livestock and livestock products, truck crops (including dried beans and potatoes), forestry and fruit (including coffee and passion fruits). Some studies compare alternative methods of production.

Time spent on these projects amounts to 32.4 professional man-years.

Although industries that supply farm inputs conduct many investigations of the cost of their products to farmers and the benefits achieved, no research of the types, and for the purposes, visualized in this area is conducted outside of public agencies.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Costs and Returns by Major Types of Farms

Annual estimates have been made for 1960 and 1961 to bring up to date the continuing series on costs and returns by type of farm. The report for 1960 covered 34 different farm types, two more than in 1959. Three costs and returns series for burley tobacco, one each for the inner, the intermediate, and the outer Bluegrass areas of Kentucky, replaced the series for tobacco-livestock in the central Bluegrass area of Kentucky.

For 1961, the number of series covered was increased to 39. Three series for cotton farms in the San Joaquin Valley of California and a series for broiler farms in Delmarva Peninsula were added. Series for grade A and grade B dairy farms in eastern Wisconsin replaced the older series from 1950 to date.

In 1960 net farm incomes were higher than in 1959 on 16 of the 34 types of farms. In general, the changes in incomes from 1959 to 1960 were not as great as usual. At the extremes were New Jersey egg-producing farms with an average net farm income per farm of $4,462 in 1960 compared with a loss of approximately $1,335 in 1959, and wheat-pea farms in Washington and Idaho with an average of $4,900 per farm (31 percent) lower net incomes in 1960 compared with a year earlier.

In 1961 net farm incomes were higher than in 1960 on 27 of 39 types of farms. They were lower on 7 types of farms and about the same on 5. Returns were higher in 1961 on dairy farms in the midwest and northeast, Corn Belt farms, western cattle ranches, tobacco farms in the Coastal Plain of North Carolina and tobacco-livestock farms in the Bluegrass area of Kentucky. They were lower on poultry farms and western sheep ranches. Changes in net farm income were quite substantial on most types of farms studied. The changes in net farm income varied from an increase of 59 percent on irrigated cotton farms in the High Plains of Texas to a decrease of 93 percent on wheat-small grain-livestock farms in the Northern Plains.

Changes in prices received for farm products was the most common factor contributing to changes in net farm income from 1960 to 1961. The second most common factor was changes in yield per acre.

Incomes in 1961 were above the previous 10-year average (1951-60) on 32 of the 39 types of farms.

Work on broiler farms has been resumed in north Georgia and started in central Maine.

Work is in progress on a project to measure the trend in cost and efficiency of cotton production by regions and for the United States. Index numbers of prices paid for goods and services used in the production of cotton are being calculated.

Additional analysis of costs and returns series has been undertaken to: (1) Determine the applicability of the series to analyze production response to price and technological changes; (2) compare optimum response and actual response; (3) study problems of aggregation of farm data for a farming area; and (4) study the growing importance of non-farm employment.

B. Costs of Production of Farm Commodities

In the central cotton-tobacco area of North Carolina, costs per pound of producing tobacco in 1956 were 16 percent lower on large farms than on small farms, and for cotton they were 20 percent lower on the large farms. Costs of producing corn were more than 40 percent lower and costs of producing soybeans, oats, and wheat were more than 50 percent lower on the large farms. Costs of producing cotton, tobacco, and corn were lowest on the large single-unit farms; costs of producing soybeans, oats, and wheat were lowest on large multiple-unit farms (farms with croppers).

Tractor and preharvest equipment costs in the Delta area of Mississippi for 1957 showed marked variability by size of farm. Moderately large farms provide greater utilization of machines and consequently lower cost per unit of use, but this study indicates no significant cost advantage as size of farm increases beyond 1,000 acres of cropland. Total preharvest equipment cost per acre of cotton ranged from $8.08 per acre on small farms to $5.26 per acre on large farms. Similar patterns were observed in the cost of owning and operating mechanical cotton pickers and small grain combines. Per-hour costs of operating tractors were lower on large farms largely because of greater annual use. Total tractor cost per acre decreased as size of farm increased despite greater use of larger, higher-priced tractors and generally more intensive practices on large farms.

A manuscript on crop production practices and costs by size of farm in the Delta area of Mississippi is now in process. Generally there was a decrease in direct cost and an increase in return per acre to land and management with an increase in size of farm up to 400 acres of cropland. Total labor requirements per acre of cotton varied little by size of farm. An average of 110 hours of direct labor, excluding supervision and management, was required per acre. On small farms 44 percent of all direct labor was hired whereas practically all of it was hired on the largest farms. When family labor is valued at hired wage rates and included with other direct costs, per acre net returns to land and management are higher on large farms. But when unpaid family labor is

excluded from direct costs, the level of net returns per acre is reversed. Unpaid labor as a residual claimant provides small farmers a "cushion" with which to partly offset lower product prices or higher prices of other factors. But it is obvious that those farmers having less than 60 acres of cropland and 15 acres of cotton can, in the absence of off-farm work, provide their families with only a subsistence level of living.

Assembling of cost data from eight cooperating western States is nearly completed for a study of the cost of owning and operating farm power and machinery used for seed-bed preparation and tillage.

The study of the cost of owning and using farm machinery by size of farm in North Dakota has been completed and a manuscript, "Wheat Growers' Machinery Costs by Size of Farm, North Dakota," has been submitted for publication. The 3 sizes of farms studied included those with 180 to 419 acres of cropland, 420 to 659 acres, and 660 to 899 acres. Total costs per acre of owning and operating tractors, 10 kinds of tractor-drawn implements, and self-propelled combines averaged about 15 percent higher on the smallest farms compared with the largest farms. The annual cost per acre on the smaller farms were highest mainly because of lower annual use per machine; the annual cost per implement was lower because the machines were older and somewhat smaller.

Data from a similar survey in Ohio are being analyzed.

Four issues of "The Farm Cost Situation" were published during the period.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Costs and Returns by Major Types of Farms

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AREA NO. 16. FARM LABOR RESOURCES AND UTILIZATION

Problem. The utilization of human effort in farm production has been changing greatly in recent decades and will likely change even more rapidly in the years to come. Technological and other economic developments increase the productivity of individual workers and make possible a decrease in the number of persons engaged in farmwork. But these developments require higher levels of skill and knowledge on the part of the persons continuing to do farmwork, while forcing other workers to seek nonfarm employment. At the same time, the increasing attractiveness of nonfarm jobs together with various social and economic changes exert upward pressures on earnings and perquisites from many types of farm employment. Because of the many economic, social, and other changes that are affecting the utilization of human effort in farm production, a better understanding of these changes is needed to assist in planning for and guiding the human and economic adjustments involved.

Work on farm labor requirements and use is carried on as a continuing program in Washington, D. C. This work is aimed at keeping abreast of farm labor requirements and use, nationally and by regions, in total and by major commodities produced. Estimates of man-hours of farmwork are prepared annually, based on pertinent secondary data and, when necessary, by field surveys. This series of estimates, going back to 1910, gives a comprehensive statistical picture of what has happened to farm labor requirements over the years.

A continuing program on farm labor productivity and efficiency is conducted in Washington, D. C. It provides annual estimates of changes in farm production per man-hour, with breakdowns by regions and by major commodities. The estimates are based on pertinent secondary data. The series of estimates provides comprehensive measures of farm labor productivity over the years. Periodically, analyses are made of the past and projected future effects of technological and other developments on production per man-hour and on quantity of labor input used.

Research on the economics of farm labor utilization is conducted. Some of the important long-term developments in U. S. farming have been the substitution of capital for labor, the discovery and adoption of labor-saving technologies of production, and the substitution of skilled for relatively unskilled human effort. Research to understand these developments and the related farm-labor adjustments is for the most part done through special studies in selected situations. Some research is located in Washington, D. C. and some at field locations. Several current projects are cooperative with the State agricultural experiment stations of California, Iowa, and Arkansas. Recently discontinued projects were cooperative with the New York, Arizona, and Mississippi stations.

The economic relationships between farm operators and hired farm workers constitutes another line of study. In certain types of farming and geographic regions, hired farmworkers are becoming a relatively larger segment of the farm workforce. Economic relationships between farm operators and hired farmworkers are becoming more complicated and less determined by custom, with the basic character of these relationships also often changing. In addition to their other managerial functions, many farm operators are now of necessity exercising a personnel function in an employer-employee relationship.

Such problems are involved here as: Seasonal peaks in labor requirements; the development of workers' skills; training of workers for particular jobs; management of workers; and determination of incentives such as the levels of wages and perquisites (including housing) and of the other terms and conditions of employment. Hired workers likewise find that they may face new or more difficult problems growing out of technologic displacement of old tasks, shifts in areas of production, longer and more frequent periods of unemployment during the year, and the necessity to learn new and more exacting skills and work habits. Research presently under way in this sub-area is cooperative with the Oregon Agricultural Experiment Station.

A total of 4 Federal professional man-years is devoted to this research area, distributed as follows: Farm labor requirements and use, 1.0 man-year; farm labor productivity and efficiency, 1.0 man-year; economics of farm labor utilization, 1.0 man-year; and economic relationships between farm operators and hired farmworkers, 1.0 man-year.

RELATED PROGRAMS OF STATE AGRICULTURAL EXPERIMENT STATIONS AND INDUSTRY

Five State experiment station projects on farm labor resources and utilization are underway, totaling about 9.2 professional man-years. In the Northeast, the characteristics and trends of migratory farm labor in New York are being studied. In the North Central region, statistical estimates of the aggregate national supply and demand functions for farm labor are being made in one project; and in another, estimates are being made of the supply and demand functions for operator labor, other family labor, and hired labor at the levels of one State and of the whole Nation. In the Southern region, one study is concerned with estimating the requirements and needs for farm labor in the agriculture of one State and appraising the adjustment opportunities outside of that State's agriculture for its excess agricultural labor; and in another project, farm labor requirements are being appraised in relation to changes in the rate of economic growth, and policies and programs for improving individuals' contributions in a growing economy are being studied.

No research projects on farm labor resources and utilization are known to be underway in industry or other private organizations.

REPORT OF PROGRESS FOR USDA AND COOPERATIVE RESEARCH

A. Farm Labor Requirements and Use

The continuing reserach on labor requirements and use in farm production showed that about 9.6 billion man-hours of labor were used on farms in 1961. This was a decrease of 4 percent from 1960 and of more than 50 percent from 1910. The long-term decrease has taken place at an increasing rate. Farm labor input during the 1920's dropped an average of 0.1 percent per year, or 8 million man-hours per year. During each of the last 3 decades, the decrease has been greater than in the previous decade, reaching an average annual decrease of 4.3 percent (549 million man-hours) during the 1950's.

Work on crops in 1961 took 4.5 billion man-hours, or a little less than half of the total for agriculture. About 3.8 billion man-hours were used in caring for livestock and their products in 1961. The remainder, 1.3 billion man-hours, was overhead work or farm maintenance jobs. The long-term decrease for livestock has been smaller than for crops, because of a greater increase in

total production of livestock and because mechanization of livestock chores has lagged behind the progress in crop operations.

These revised estimates of man-hours of farmwork incorporate new data, changes in acreage and production based on the 1959 Census of Agriculture, and new labor coefficients for farm products. The latter were developed for each State and will be released in three publications. These estimates of labor coefficients indicate considerable variation among States in labor requirements per unit of farm product. In livestock products, for example, in 1959 California farmers on the average produced a hundred pounds of milk with only 0.9 man-hours of labor, whereas other areas with smaller herds and less productive cows required somewhat more labor per cwt. of milk produced. In field crops, for example, in 1959 Iowa farmers on the average took less than 7 minutes per bushel to grow and harvest corn for grain, whereas in other States the average labor coefficient was more than a half hour per bushel. Similarly in truck crops, New Jersey farmers on the average produced 100 pounds of sweet corn for fresh market with 0.7 man-hours of farmwork, whereas Missouri farmers took 1.1 hours of farmwork per cwt.

As secondary data were not generally available for estimating labor requirements for truck crops, primary data thereon were collected by a private research firm under contract. Almost 2,500 vegetable producers, who harvested almost 219,000 acres of truck crops in 12 major producing areas, were interviewed. Data collected included labor inputs by field operation, production practices, kind of labor performing each operation, material inputs and costs, and contractual arrangements between producers and buyers. Analyses of these data continued and four research reports have been prepared. One of the findings of these truck-crop surveys shows how the forms of vertical coordination vary among truck crops. Contracts between farmers and buyers--relatively loose forms of vertical coordination--are more prevalent in the production of vegetables for processing than of those for the fresh market. In contrast, grower-shippers and other forms of full vertical integration are more common in the production of vegetables for fresh markets than of those for processed markets.

B. Farm Labor Productivity and Efficiency

The continuing research on labor productivity and efficiency in farm production showed that farm output per man-hour in 1961 reached a new all-time high--nearly double that of 1950, and about 4 times higher than 50 years ago. Contrary to the long-time trend, from 1960 to 1961 production per man-hour rose more for livestock than for crops. During the last two decades crop production per hour has almost tripled, while that of livestock has little more than doubled.

The upward climb in farm production per unit of labor is revealed by another measure of labor productivity--the ratio of farmworkers to the population fed and clothed from U. S. production. In 1961, this ratio was 1:27. The ratio has changed drastically over time--in 1820 it was 1:4; in 1920, 1:8; and in 1950, 1:15. Nearly as much gain has been registered in the last 11 years as occurred in the 130 years prior to 1950. Improved technology both on and off the farm has enabled a decreasing number of farmworkers to produce increasing quantities of farm products.

C. Economics of Farm Labor Utilization

A project on labor and capital in selected crops and areas of California is under way in cooperation with the California Agricultural Experiment Station.

For the first phase, Kern County, where cotton is the predominant crop and potatoes and fruits are next in importance, was selected. This phase of the project revealed that in Kern County, harvesting of cotton has been completely mechanized during the last twelve years, displacing about 25 thousand workers and eliminating what had previously been the highest seasonal labor peak during the year. The spring operations of potato picking and cotton chopping are now also being mechanized. When these have occurred, it will have become economically possible to develop a stable resident seasonal labor force having the opportunity for relatively full employment throughout the year. At present, however, individual workers prefer to work in certain crops and are averse to work in other crops, because of custom or (for some ethnic groups) the presumed low status of particular work. If a stable local farm labor supply is to be developed in Kern County, farmworkers will need to become less specialized and to adapt more easily to changes in labor demands during the season. Three manuscripts are being prepared covering the Kern County phase.

The recently initiated second phase of the project on labor and capital in selected crops and areas of California will study farm labor utilization in Stanislaus County, where peaches are the leading crop and secondary crops are apricots, tomatoes, walnuts, and almonds. This phase has already revealed that the need for and reliance on seasonal migratory labor are increasing in that county, because of expansion in peach production (with peak seasonal labor needs at harvest) and mechanization of the fall labor needs in the secondary crops.

A project on alternative uses of labor and alternative income opportunities for low-income rural families in the Ozarks of Arkansas is cooperative with the Arkansas Experiment Station. Analysis of the data has been completed, a report of preliminary findings published, and the final report is being prepared. Findings are as follows: Outmigration has for decades been one of the major adjustments that Ozark people have made in response to lack of local employment opportunities; an expanded program of educational and vocational training (including career exploration) should be an integral part of all phases of the development program for such areas; some farm families in the area have greatly improved their incomes through substantial farming adjustments, but such adjustments are beyond the capabilities of many if not most of the low-income rural people of the areas; and because of age, poor health, or educational handicaps, some low-income rural families are quite incapable of outmigration, nonfarm employment within the area, or substantial adjustments to become commercial farmers.

A theoretical analysis of the incidence of increasing wage costs in farm production was completed and the results published. Findings were as follows: Contrary to a widely held view, it is far from certain that for most farm products the ultimate incidence of higher farm wage rates falls largely on the farm operator; production and consumption of particular farm products may decrease as a result of higher wage rates for hired labor; production in particular farming regions may also be vulnerable to competition from other regions, as a consequence of increasing wage rates for hired labor; and the tendency of a minimum wage or unionization of unskilled farm laborers to cause

some unemployment suggests that such measures need to be accompanied by other programs to raise the productivity of displaced workers, if the latter are to be re-employable.

The production economics phase of a study of the pecan industry is cooperative with the Marketing Economics Division of ERS and the experiment stations of Arkansas, Florida, Georgia, Mississippi, New Mexico, and South Carolina. Preliminary findings are that labor requirements for producing pecans have decreased as a result of increased mechanization, particularly in the harvest operation where pecans are being both mechanically shaken from the tree and picked up mechanically.

An econometric study of the demand for farm labor was recently initiated, cooperative with the Iowa Agricultural Experiment Station. The approach being used is multiple regression analysis, with such variables as the following being included: Farm and nonfarm wage rates; farm and nonfarm employment levels; and rates of utilization and prices of productive inputs that compete with labor.

A study of the characteristics, employment patterns, and earnings of migratory farmworkers in New York State was discontinued. Findings were previously reported. Drafts of five reports of the research are being revised for publication.

A project on the economic adjustment problems of Papago Indian households in Arizona, cooperative with the Arizona Experiment Station, was discontinued when the report was revised for publication and two journal articles were prepared. Findings were previously reported.

A study of the relation of technology and production adjustment programs to the requirements for and utilization of the farm labor force in the Mississippi Delta, cooperative with the Mississippi Agricultural Experiment Station, became inactive and was discontinued. Findings were previously reported. Division personnel had completed their work on this project, but personnel shortages prevented the cooperating station from finishing its final phase.

Two special inter-disciplinary studies were made, one of the overall impact of technology on farm labor and farm tenure, and the other of our country's past and present farm labor policies and programs. Results were reported in two chapters of a book on rural land tenure published by the Louisiana State University Press.

D. Economic Relationships between Farm Operators and Hired Farm Workers

The first project in this new sub-area of work is a recently initiated study of the costs and feasibility of alternative methods of providing seasonal housing for migrant farm workers. Such related questions as the following are also being studied: The extent to which provision of housing attracts an adequate supply of seasonal hired labor; whether the availability of credit to farm operators influences the quantity and physical characteristics of the housing provided migrant farm workers; and whether the effectiveness of supervision of migrant workers in their use of housing influences the costs of providing such housing, the physical characteristics of housing facilities, and the living conditions associated with workers' use of housing. The project is cooperative with the Oregon Agricultural Experiment Station.

PUBLICATIONS REPORTING RESULTS OF USDA AND COOPERATIVE RESEARCH

A. Farm Labor Requirements and Use

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B. Farm Labor Productivity and Efficiency

Farm Economics Division. 1961. Changes in farm production and efficiency. USDA Stat. Bul. No. 233, Revised.

C. Economics of Farm Labor Utilization

LeRay, N. L. 1961. "Farm labor on large cotton plantations in the Delta area of Mississippi." The Labor Market and Employment Security. U. S. Dept. of Labor, Jan. 1961, pp. 7-12.

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Metzler, W. H. and Sargent. F. O. 1962. "Problems of children, youth, and education among mid-continent migrant." Southwestern Social Sciences Quarterly. June 1962. pp. 29-38.

D. Economic Relationships between Farm Operators and Hired Farm Workers

None

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in	
Old	New			Summary of Progress	Area & Subheading
FE d2-1 (Rev.)	FE 13-1	Maintenance, improvement, and analyses of overall measures of farm production	Washington, D.C.	Yes	1-A
FE d2-2 (Rev.)	FE 13-2	Measures and analyses of changes in resources used, and efficiency of resource use in agriculture	Washington, D.C.	Yes	1-A
FE e3-23	---	Long-term outlook for western agriculture (Disc. 7/62)	Washington, D.C. & Berkeley, Cal.	Yes	1-A
FE e3-20	FE 9-28	Economic appraisal of regional adjustments in agr. production & resource use to meet changing demand and technology (Pending)	Washington, D.C. & Ames, Iowa	Yes	1-B
---	FE 9-19	Analysis of agricultural production response (Pending)	Washington, D.C.	Yes	1-B
FE e3-31) e3-35) e3-36) e3-8) (Rev.)) e3-11) (Rev.))	FE 9-15	Appraisal of adjustments in dairy farming in the Lake States and adjoining areas to meet changing economic conditions (Pending)	Washington, D.C., E.Lansing, Mich., St. Paul, Minn., Ames, Iowa, Madison, Wis. & Urbana, Ill.	Yes	1-C
FE e3-52) e3-12) e1-14)	FE 9-16	Appraisal of adjustments in dairy farming in the Northeast to meet changing economic conditions (Pending)	Washington, D.C., and 10 North-eastern States	Yes	1-C
FE e3-22) e3-24) e3-25) e3-28) e3-47)	FE 9-22	An economic appraisal of farming adjustment opportunities in the Southeastern Region to meet changing economic conditions (Pending)	Athens, Ga., Raleigh, N.C., Auburn, Ala., Clemson, S.C., Knoxville, Tenn.	Yes	1-D
FE e3-29	---	Part-time farming in the Piedmont area of South Carolina (Disc. 8/62)	Clemson, S.C.	Yes	1-D
FE e3-26) e3-27) e3-34) e3-37) e3-38)	FE 9-27	An economic appraisal of farming adjustment opportunities in the South Central Region to meet changing economic conditions (Pending)	College Sta. Tex. Stoneville, Miss. Stillwater, Okla. Fayetteville, Ark. Baton Rouge, La.	Yes	1-D
FE e3-46	FE 9-7	Adjustments in cotton producing areas of California	Davis, Calif.	Yes	1-D
FE e3-45	FE 9-6	Adjustments in irrigated crop production in the Upper Texas Panhandle	College Sta., Tex.	Yes	1-D
FE e1-22	FE 9-26	An economic appraisal of alternative systems of farming and ranching in the Great Plains area of Oklahoma (Pending)	Stillwater, Okla.	Yes	1-D
FE e3-50	FE 9-8	Adjustments in the economy of the Belle Fourche area and analysis of Newell Field Station experiments	Newell, S. Dak.	Yes	1-E
FE e3-6) e3-7) e3-49)	FE 9-17	Economics of adjustments on farms and production response in the Northern Plains wheat producing region (Pending)	Bozeman, Mont., Fargo, N.D. and Brookings, S.D.	Yes	1-E
FE e3-7) e3-41) e3-48)	FE 9-23	Economics of adjustments on farms and production response in the Southern Plains wheat producing region (Pending)	Manhattan, Kans., Lincoln, Nebr. & Ft. Collins, Colo.	Yes	1-E
FE e3-30) e3-42) e3-43) e3-48)	FE 9-24	Economics of adjustments on farms and production response in the Pacific Northwest wheat producing region (Pending)	Pullman, Wash., Corvallis, Oreg. and Moscow, Idaho	Yes	1-E
FE e1-17 e1-23	FE 9-25	Farm management under conditions of variable output in the Great Plains (Pending)	Bozeman, Mont. & selected areas	Yes	(1-E & (1-G
FE e3-51	FE 9-9	An economic appraisal of adjustment opportunities in southern rice producing areas	Fayetteville, Ark.	Yes	1-F

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in Summary of Progress	Line Proj. Incl. in Area & Subheading
Old	New				
FE e3-39	FE 9-5	Economics of adjustments in beef production in the West	Ft. Collins, Colo.,Lincoln, Nebr.,Tucson, Ariz.	Yes	1-G
FE e3-54	FE 9-11	Economic appraisal of adjustments in Corn Belt farming to meet changing conditions	Ames, Iowa, & selected States	Yes	1-G
FE e1-29	FE 9-21	An economic appraisal of emerging crop, livestock and poultry technologies in the Northern Region (Pending)	Urbana, Ill.	Yes	1-G
FE e1-25	---	Economic analysis of adjustments in ranch management associated with range & pasture improvement practices in California	Davis, Calif.	Yes	1-G
FE e1-30	---	Economics of livestock production and range management in the plains of Wyoming	Laramie, Wyo.	Yes	1-G
FE e1-31	---	Economics of adjustment to range improvement practices	Davis, Calif.	Yes	1-G
FE c1-15	---	Costs and performance of selected farm machines in Nebraska	Lincoln, Nebr.	Yes	1-G
FE e3-18	---	Farmers' financial condition, tenure, land ownership, and land prices in relation to agricultural adjustment in the Great Plains (Disc. 7/62)	Washington,D.C. & selected States	No	---
FE e1-26	---	Adjustment opportunities on irrigated farms in the North Unit, Deschutes Project, Oregon (Disc. 8/62)	Corvallis, Oreg.	No	---
FE e1-28	---	Economics of cattle production and range management in western South Dakota (Exp. 7/62)	Brookings,S.D.	No	---
FE e3-32	---	Production specialization as an agricultural adjustment in the Saginaw Valley and Thumb area of Michigan (Disc. 8/62)	East Lansing, Mich.	No	---
FE e3-44	(C)---	Adjustments in dairy and feed production in California (Disc. pending)	Davis, Calif.	No	---
FE d2-3	FE 13-4	Appraisal of farm production prospects and resource needs (Pending)	Washington,D.C.	Yes	1-A
FE e3-2 (Rev.)	FE 9-1	Economic evaluation of forage production and utilization in New Hampshire	Durham, N. H.	No	---
FE e3-53	FE 9-10	Effects of alternative levels of grazing fees and privileges on ranch organization and net returns in public land areas	Davis, Calif.& 10 other Western States	Yes	1-G
FE c2-6	FE 9-12	Economic appraisal of soil, water and crop practices on farm and ranch lands in the 17 western States	Ft. Collins, Colo., & 16 other western States	Yes	1-G
---	FE 9-13	Economic appraisal of boll weevil damage and alternative methods of control	State College, Miss.	No	---
FE e3-13	FE 9-14	Economic appraisal of adjustments in Corn Belt farming to meet changing conditions	Ames, Iowa & 7 other Corn Belt States	Yes	1-G

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in	
Old	New			Summary of Progress	Area & Subheading
FE e2-9	---	Overcoming obstacles to soil conservation in western Iowa (Disc. 8/62)	Ames, Iowa	Yes	2-B
FE e2-10	---	Analyses of profitableness of soil conservation practices and their order of adoption in farm development in Wisconsin	Madison, Wis.	Yes	2-B
FE e2-11	FE 9-3	Estimating costs and returns of conservation practices in western Iowa	Ames, Iowa	No	---
FE e2-12	FE 9-4	An economic evaluation of changes in use of flood plain land in Wisconsin watershed projects	Madison, Wis.	Yes	2-B
FE e3-15	---	An economic analysis of adjustment opportunities on Georgia farms	Athens, Ga.	No	---
FE e1-1 (Rev.)	FE 9-2	A study of farm organization and management problems in southeastern and southwestern Minnesota	St. Paul, Minn.	Yes	2-A
FE e1-7 (Rev.)	---	Economics of beef production in farming systems in the Mississippi Delta	Stoneville, Miss.	No	---
FE e1-18	---	Economic evaluation of alternative production practices on specialized poultry farms in New Hampshire	Durham, N. H.	Yes	2-A
FE e1-27	---	Economic evaluation of alternative production practices on specialized poultry farms in Connecticut	Storrs, Conn.	Yes	2-A
FE c1-16	---	An economic evaluation of alternative systems of field shelling, drying, and storage of shelled corn on cornbelt farms	Urbana, Ill.	Yes	2-A
FE c1-17	---	Economics of mechanization on Mississippi cotton farms	Stoneville, Miss.	Yes	2-A
FE c2-8	---	An economic appraisal of selected production practices on commercial farms in Pennsylvania	University Park, Pa.	Yes	2-A

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in	
Old	New			Summary of Progress	Area & Subheading
FE P-1	---	Pioneering research in vertical coordination	Washington, D.C.	Yes	3-A
FE e4-1	---	An economic analysis, in selected regions, of returns to resources used on different sizes of farms	Washington, D.C. and Ames, Iowa	Yes	3-B
FE e4-8	FE 10-1	Economic appraisal of minimum farm resources needed for specified farm income levels	Washington, D.C.	Yes	3-B
FE e4-12	FE 10-2	Classification and analysis of kinds and sizes of farms	Washington, D.C.	Yes	3-B

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in Summary of Progress	Area & Subheading
Old	New				
FE a1-1 (rev.)	FE 1-1	Maintenance & improvement of farm mortgage credit statistics	Washington, D.C.	Yes	4-B
FE a2-1 (rev.)	FE 1-2	Production credit in agriculture - maintenance & improvement of statistics & analysis of trends, terms, & problems	Washington, D.C.	Yes	4-C
FE a2-3 (rev.)	FE 1-3	Operations of financial institutions that extend short- & intermediate-term credit to farmers	Washington, D.C. and Madison, Wis.	Yes	4-C
FE a3-1	FE 1-4	Savings & investments of farm operators	East Lansing, Mich.	Yes	4-C
FE a3-2	FE 1-5	Balance sheet of agriculture	Washington, D.C.	Yes	4-A
FE a1-5	FE 1-6	Relationship of supply & demand for long-term farm credit to adjustments in agriculture	Lafayette, Ind.	Yes	4-B
FE a2-8	---	Effective use of capital & credit in agricultural adjustment in Wisconsin	Madison, Wis.	Yes	4-C
---	FE 1-7	Cost, terms, & availability of credit for rural housing	Washington, D.C.	Yes	4-B
FE a2-7	FE 1-8	Financing modern large-scale farming operations in Michigan (Supersedes FE a2-7)	East Lansing, Mich.	Yes	4-C
FE a1-4	---	Analysis of factors affecting farmers' use & management of credit (Disc. 5/62)	Lafayette, Ind.	No	---
FE a2-5	---	Development of finance management guides for farm people (Disc. 5/62)	Washington, D.C.	No	---
FE a2-6	---	Effects of contracting on capital requirements, financial security, & financial returns of egg producers & on efficiency in production of table eggs (Disc. 5/62)	Washington, D.C.	No	---

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in	
Old	New			Summary of Progress	Area & Subheading
FE a4-1 (rev.)	FE 3-1	Improvement of farmers' mutual fire, windstorm, & crop-hail insurance company operations	Washington, D.C.	Yes	5-A
FE a4-2 (rev.)	FE 3-2	Organized farm fire protection & estimation of annual farm fire losses	Washington, D.C.	Yes	5-B
FE a4-3 (rev.)	FE 3-3	Casualty & life insurance & accident prevention for farmers	Washington, D.C.	Yes	5-C
FE a4-7 (rev.)	FE 3-4	Analysis of risks & risk-bearing	Washington, D.C. and Bozeman, Mont.	Yes	5-D

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in Summary of Progress	Line Proj. Incl. in Area & Subheading
Old	New				
FE a5-1	FE 4-1	Studies of the impact & economic effects of taxes on agriculture	Washington, D.C. and selected States	Yes	6-A & B
FE a5-5	---	Development of improved methods for valuation of agricultural lands in Michigan with special emphasis on assessment for tax purposes (Disc. 7/62)	East Lansing, Mich.	No	---
FE a5-6(C)	FE 4-2	Organization and financing of local government in rural areas, with special emphasis on rural areas influenced by suburban & industrial development	Washington, D.C. and selected States	Yes	6-C
FE a5-7	FE 4-3	State-local fiscal structures and their relation to farm taxes	Washington, D.C. and selected States	Yes	6-A & C

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in Summary of Progress	Line Proj. Incl. in Area & Subheading
Old	New				
FE b1-1 (rev.)	FE 2-1	Current developments in the farm real estate situation	Washington, D.C.& Champaign, Ill. Madison, Wisc. Manhattan, Kan.	Yes	7-A&B
FE b1-2	FE2-2	Annual estimates and analyses of trends in farm real estate rentals	Washington, D.C.	Yes	7-C

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. In	
Old	New			Summary of Progress	Area & Subheading
FE b3-5 (Rev. #2)	FE 5-1	Economic appraisal of land resource development in the United States	Washington, D. C. & Ames, Iowa	Yes	8-E
FE b3-11	FE 5-2	Economic appraisal of impacts of urban growth on rural land use	Washington, D. C. & Newark, Del.	Yes	8-C
FE b3-12	FE 5-3	Development of economic land classification techniques for the Great Plains	Lincoln, Nebr.	Yes	8-A
FE b3-13	FE 5-4	An economic evaluation of agricultural land drainage and related management of farms in Michigan	East Lansing, Mich.	Yes	8-D
FE b3-1 (Rev.)	FF 5-5	National land use inventory	Washington, D. C.	Yes	8-A & 8-B
FE b3-10	---	Economic appraisal of changes in agricultural land use and ownership associated with opportunities for off-farm employment in Virginia	Blacksburg, Va.	Yes	8-B
ORR-0-0-1 (FE)	---	Use of rural land for outdoor recreation (Disc. 5/62)	Washington, D. C.	Yes	8-C

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in Summary of Progress	Line Proj. Incl. in Area & Subheading
Old	New				
FE b2-5 (Rev.)	FE 6-1	Economics of supplemental irrigation in East Texas	College Station, Texas	Yes	9-B
FE b2-11	FE 6-2	Economics of supplemental irrigation in Mississippi	Stoneville, Miss.	Yes	9-B
FE b2-17	FE 6-3	Economic appraisal of irrigation on Missouri farms	Columbia, Mo.	Yes	9-B
FE b2-18 (C)	FE 6-4	Characteristics, use, and occupancy of rural flood plains	Chicago, Ill., & Washington, D.C.	Yes	9-B
FE b2-20	FE 6-5	Economics of land forming in eastern States	Ames, Iowa	Yes	9-C
FE b2-21	FE 6-6	Economic appraisal of agricultural water use and supply	Washington, D. C.	Yes	9-A
FE b2-22	FE 6-7	Economic appraisal of conveyance systems in California	Berkeley, Calif.	Yes	9-C
FE b2-23	FE 6-8	Improved methods for economic evaluation of land and water resource development projects	Washington, D. C.	Yes	9-C
FE b2-19	FE 6-9	Values of water for irrigation and competing uses in the Upper Colorado River Basin	Fort Collins, Colo.	Yes	9-A
FE b2-13	FE 6-10	Economic appraisal of humid area irrigation trends and potentials	Washington, D. C.	Yes	9-A
FE b2-8	FE 6-11	Economics of watershed management	Ames, Iowa & Washington, D. C.	Yes	9-B
FE b2-16 (C)	FE 6-12	Profitable farm adjustments to limited irrigation water in the Central Utah Project	Logan, Utah	Yes	9-A
FE b2-7	---	Economics of supplemental irrigation in South Carolina	Clemson, S. C.	Yes	9-B
FE b2-15	---	Economic study of the high water table problem on the Newlands Reclamation Project, Nevada	Reno, Nevada	Yes	9-B
FE b2-14	---	Economics of watershed protection programs in Oklahoma	Stillwater, Okla.	No	---

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl.in	
Old	New			Summary of Progress	Area & Subheading
FE b4-3 (Rev.)	FE 7-1	Legal aspects of water rights in the West	Berkeley, Cal.	Yes	10-A-2
FE b4-4 (C) (Rev)	---	Legal aspects of water rights in the East	Madison, Wis.	Yes	10-A-1
FE b4-10	FE 7-2	Impacts of highway construction on farms	Washington, D.C.	Yes	10-D-3
FE b4-12	FE 7-3	Easements and protective covenants for guiding rural land use	Lincoln, Nebr. and Washington, D. C.	Yes	10-D-1
FE b4-8	FE 7-4	Economic appraisal of local resource organizations	Washington, D.C.	Yes	10-C
FE b4-11 (Rev.)	FE 7-5	Analysis of rural zoning enabling statutes and ordinances	Washington, D.C.	Yes	10-B-
FE b4-9	---	Appraisal of measures for guiding the use of water and privately owned rural land resources for recreation (Disc. 5/62)	Madison, Wis.	Yes	10-D-4

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Old	New				
FE b5-5	FE 8-1	Maintenance of current information on farm leases	Washington,D.C.	Yes	11-B-1
FE b5-10(C)	FE 8-2	Analysis of legal-economic aspects of contract farming	Iowa City,Iowa	Yes	11-B-2
FE b5-12	FE 8-3	Analysis of the family farm corporation as it affects tenure and resource use	Iowa City and Ames, Iowa	Yes	11-C-1
FE b5-14	FE 8-4	Economic analysis of farm tenure in resource use adjustment in Iowa	Ames, Iowa	Yes	11-C-2
FE b5-15	FE 8-5	Economic appraisal of interrelations between farm tenure arrangements and agricultural production programs in the Southeast	Raleigh, N.C.	Yes	11-C-3
FE b5-16	FE 8-6	Analysis of land tenure problems and policies in Puerto Rico	Rio Piedras,P.R.	Yes	11-C-4
FE b5-8	FE 8-7	Appraisal of the economic aspects of land tenure laws	Iowa City, Iowa and Lincoln,Nebr.	Yes	11-B-3
FE b5-7(C)	FE 8-8	Development and analyses of basic farm tenure information	Washington,D.C.	Yes	11-A
FE b5-13	----	Economic analysis of the effect of land ownership patterns on resource development in the low income area of northern Wisconsin	Madison, Wis.	Yes	11-C-2
FE b5-11	----	Economic analysis of relationships between contract farming and farm tenure (Disc. 6/62)	Fargo, N. Dak.	Yes	11-B-2
FE b5-2	----	Influence of tenure arrangements on farming efficiency (Disc. 3/61)	Lincoln, Nebr.	Yes	11-A
FE b5-4	----	Analysis of the tenure implications of the social security program for farmers (Disc. 3/61)	Washington,D.C.	No	----
FE b5-6	----	Analysis to aid improvement of economic-legal aspects of farm tenancy in Iowa (Disc. 3/61)	Iowa City, Iowa	No	----

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Line Project Number		Line Project Titles	Work Locations During Period	Line Proj. Incl. in	
Old	New			Summary of Progress	Area & Subheading
FE e4-4	---	Characteristics of the resources, resource use, and sources of income for low-income farms and States (Disc. 7/61)	Washington, D.C.	Yes	12A
FE e4-9	---	Appraisal of opportunity for adjustments in full-time and part-time farming in the Ozark Plateaus of Oklahoma (Disc. 6/62)	Stillwater, Okla.	Yes	12A
FE e4-11	---	Appraisal of opportunities for improving the economic status of farm people in Eastern Tennessee	Knoxville, Tenn.	Yes	12A
FE e4-12	FE 10-2	Classification and analysis of kinds and sizes of farms	Washington, D.C.	Yes	12A
FE e4-13	FE 10-3	Effects of Changes in size of farm on farm output and efficiency	Washington, D.C.	Yes	12A
FE e4-14	---	Appraisal of adjustment opportunities of farm people in low production farm areas in N.E. Texas (Disc. 6/62)	College Sta., Texas	Yes	12B
FE e4-15	FE 16-2	An appraisal of farming adjustments associated with increased nonfarm employment of farmers for a commercial farming area of Texas	College Sta., Texas	No	---
FE e4-18	FE 16-4	Appraisal of characteristics of successful farms and farmers in low income areas	Washington, D.C.	Yes	12A
---	FE 16-7	Income and resource characteristics of farm operator families	Washington, D.C.	Yes	12B

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Old	New				
FE e4-17	FE 15-1	An economic evaluation of recreation as a use of resources in the Ozarks of Missouri	Columbia, Mo.	Yes	13-C
---	FE 15-2	The dynamics of physical and human resource use adjustment in specified areas	Washington, D. C. & selected states	No	---
---	FE 15-3	An evaluation of rural resource use and potentials for economic development--selected low income areas in Ark. and adjoining states	Fayetteville, Ark.	Yes	13-C
FE e4-7	---	Analysis of factors and problems in economic progress in low-income farm areas	Washington, D. C.	No	---
FE e4-17	FE 16-1	An economic appraisal of adjustments in the use of resources on low income farms in the Willamette Valley of Oregon	Corvallis, Ore.	No	---
FE e4-16	FE 16-3	An analysis of factors affecting resource adjustments on low income rural areas in Mich.	East Lansing, Mich.	Yes	13-A
FE e4-19	FE 16-5	Effects of National Economic Development upon the development of low income farm areas in North Carolina	Raleigh, N. C.	Yes	13-B
FE e4-10	---	Economic appraisal of changes in use of agricultural resources, organization and income from off-farm employment in Pennsylvania	University Park, Pa.	Yes	13-A
FE e4-20	FE 16-6	The relation of urban industrial development to low incomes in agriculture	Washington, D. C.	Yes	13-A

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Old	New				
FE c1-6 (Rev.)	FE 12-1	Measurement and analysis of progress in farm mechanization	Washington, D.C.	Yes	14-A
FE c1-13	FE 12-2	National survey and analysis of selected farm production practices	Washington, D.C.	Yes	14-A
FE c3-1 (Rev.)	FE 12-3	Maintenance and improvement of annual estimates of feed consumption and animal units in the U. S.	Washington, D.C.	Yes	14-D
FE c3-4 (Rev.)	FE 12-4	Economics of hog feeding and management to produce lean meat (Disc. 7/62)	Washington, D.C.	No	---
FE c3-6	FE 12-5	Effect of contract hog production on capital inputs, costs, financial returns and feeding efficiency in market swine production (Disc. 7/62)	Washington, D.C.	Yes	14-D
FE c2-1) (Rev.)) FE c2-5) FE c2-9)	FE 12-6	Economic interpretation of yield responses to fertilizer and associated technology	Washington, D.C.	Yes	14-C
---	FE 12-7	The farm demand for fertilizer, machinery, and structures	Washington, D.C.	Yes	14-A
FE c2-10	FE 12-8	Estimates of principal plant nutrients used on specified crops	Washington, D.C.	Yes	14-E
FE c1-14	---	Economics of milking dairy cows with special attention to the herringbone system (Disc. 7/62)	Washington, D.C.	No	---
FE c3-5	---	Economic analysis for determining minimum cost feed mixtures (Disc. 7/62)	Washington, D.C.	No	---
FE c3-7	---	Competitive position of alternative methods of processing feeds on dairy, livestock, and poultry farms (Disc. 7/62)	Washington, D.C.	No	---

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Old	New			Summary of Progress	Area & Subheading
FE d1-1 (Rev.)	FE 14-1	Annual estimates and analyses of changes in costs, returns and farm organization on commercial, family-operated farms by type and size in the major agricultural areas in the United States	Washington, D. C.	Yes	14-A
FE d1-7	---	Estimates and analysis of costs of producing major farm commodities (Disc. 7/62)	Washington, D. C.	No	---
FE d1-9	---	Analysis of farm production response to changes in costs and prices on selected types of farms (Disc. 6/61)	Washington, D. C.	No	---
FE d1-10	---	Preparation of farm cost situation reports	Washington, D. C.	Yes	14-B
FE d1-11 (Rev.)	FE 14-3	Costs and returns on commercial poultry farms (egg and broiler) in the Northeastern, Middle Atlantic and Southeastern States	Washington, D. C.	Yes	14-A
FE d1-12	---	Costs and returns on irrigated cotton farms in the San Joaquin Valley, California (Disc. 1/61)	Davis, Calif.	Yes	14-A

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Old	New				
FE c4-1 (Rev.)	FE 11-1	Maintenance and improvement of annual estimates of labor requirements in American agriculture	Washington, D.C.	Yes	16-A
FE c4-2 (Rev.)	FE 11-2	Measurement and analysis of labor productivity and efficiency in American agriculture	Washington, D.C.	Yes	16-B
FE c4-16 (Rev.)	FE 11-3	Labor and capital in selected crops and areas in California	Davis, Calif.	Yes	16-C
FE c4-15	FE 11-4	An economic study of alternative income opportunities for low-income rural families in the Ozarks of Arkansas	Washington, D.C. & Fayetteville, Ark.	Yes	16-C
---	FE 11-5	Economic and related aspects of providing housing for migrant hired farmworkers	Washington, D.C. & Corvallis, Ore.	Yes	16-D
FE c4-10(C)	---	Economic analysis of migratory farmworkers in New York State (Disc. 7/62)	Washington, D.C. & Ithaca, N.Y.	Yes	16-C
FE c4-14	---	Economic adjustment problems of Papago Indian households in Arizona (Disc. 7/62)	Tucson, Ariz.	Yes	16-C
FE c4-13	---	Analysis of the relation of technology and production adjustment programs to labor force requirements and utilization in the Mississippi Delta (Disc. 8/61)	Washington, D.C. & Stoneville, Miss.	Yes	16-C